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THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

1923

Regional Anatomy—*Prentiss*

A Clinical Study in Chronic Arthritis —*Meisser and Brock*

Innervation of the Oral Cavity—*Prothero*

Local Anesthesia—*Schultz*

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A Sermon—*Coston*

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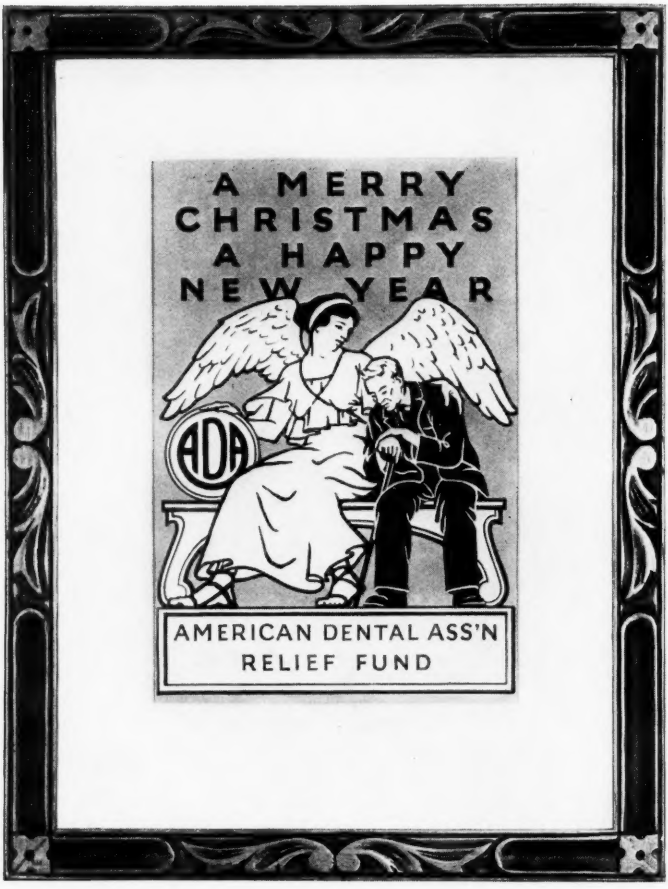


THE NEW CHRISTMAS SEAL OF THE AMERICAN DENTAL ASSOCIATION

THE JOURNAL
OF THE
American Dental Association
VOL. 10 DECEMBER, 1923 NO. 12

Original Communications

REGIONAL ANATOMY, EMPHASIZING MANDIBULAR MOVEMENTS WITH SPECIFIC REFERENCE TO FULL DENTURE CONSTRUCTION

By H. J. PRENTISS, M.D., Iowa City, Iowa

(Read before the American Dental Association, Cleveland, Ohio, September 10-14, 1923)

IT IS a great pleasure to me to find that my studies of the mechanism of the temporomandibular articulation have been of interest to the dental profession. My studies have necessitated my referring to a few of the lower forms for enlightenment as to the human type, but I will endeavor not to be didactic in bringing these forms into the discussion. However as a non-dental man, though an instructor to dental students, I refuse to be referred to, in relation to the mechanism of prosthetics, as an authority.

The temporomandibular joint is, we can say for simplicity, a gliding hinge joint, or more correctly a gliding condyloid joint. Technically it is called an arthrodial diarthrosis or gliding movable joint. The surfaces entering into this movement are the elliptical condyle of the mandible and the glenoid concavity of the temporal bone continuous with the eminentia articularis convexity. In other words a convex circumscribed surface articulating with a concavoconvex surface.

Interposed between the condyle of the mandible and the concavoconvex surface of the temporal bone is a fibrocartilage meniscus which adjusts itself to the movements of the condyle.

In a dry skull, with perfect occlusion, a space separates the condyle from the temporal bone. In the fresh state this space is filled in by the fibrocartilage. All joints with a free gliding movement present such a meniscus as the sternoclavicular or femorotibial joints. If we refer to Figure 1, which is a vertical cross section of an early embryo we observe that the rami are mainly developed

in cartilage as well as the temporal bone. A double liquifaction has occurred and we see a fibrocartilage presenting, with

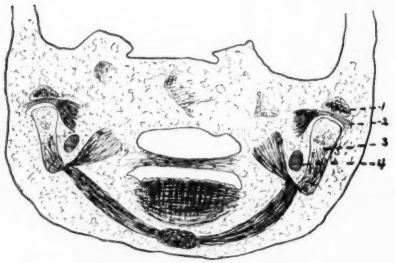


Fig. 1.—Coronal section of human embryo at the temporomandibular joint. (1) Temporal bone—endochondral. (2) Meniscus with the sphenomeniscus muscle attached. (3) Ramus of the mandible, mainly endochondral. (4) Meckel's cartilage.

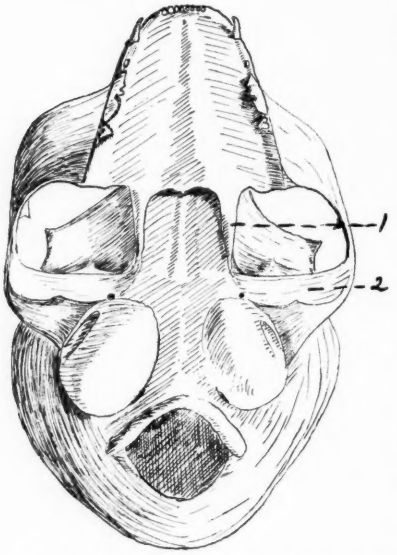


Fig. 2.—Inferior view of base of cat's skull. (1) Vertical plate of palate bone. (2) Concave articular surface for mandible.

a double-joint space between it and the temporal bone on the upper side and the mandible on the lower side. Also note the large muscle attaching to this meniscus—(the sphenomeniscus muscle).

If we refer to the lower animal types—namely: the cat, a carnivorous type, Figures 2 and 3; the steer, a herbivorous type, Figures 4 and 5; and the dog with a mixed dentition, Figure 6—we note that none of these types have a pterygoid plate, but a rather excessive vertical

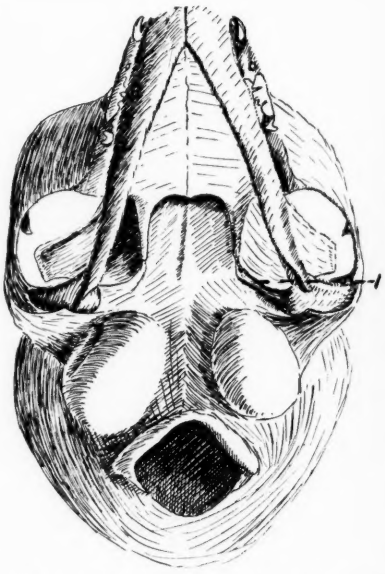


Fig. 3.—Basal view of cat's skull with mandible in position. (1) Sphenomeniscus muscle small.

plate of the palate. They have no external pterygoid muscle but a sphenomeniscus muscle, as said muscle arises from the under surface of the great wing of the sphenoid and inserts mainly into the capsule and therefore into meniscus of the joint. I call attention to this fact early in this paper as we find a similar muscle in the human type, which muscle is called the upper head of the external pterygoid. I feel that it is the single muscle present in these lower types, which has to do with the lateral motion

necessary in the scissors-like action of the pure carnivora to prevent locking, and more so in the herbivorous type. In the human type, due to the enormous vertical development of the faces, secondarily to the brain overgrowth, the ramus overgrows and also the large external pterygoid plate, and therefore a new muscle develops, the true external pterygoid which inserts into a deep fossa on the neck of the condyle of the ramus of the mandible. This development is accompanied by the vertical downward growth of the articular eminence. Therefore, this external pterygoid muscle is concerned primarily with the opening of the jaw, and only secondarily with the lateral movement, as I have indicated. It is the sphenomeniscus muscle which concerns the prosthetist in the grinding motion, and not the external pterygoid which is the true opener of the jaw. Referring to the pure anatomy of the human type, (Fig. 7) is from a skull at term. Though no teeth have erupted, this skull presents full alveolar processus and we note that the occlusal plane in passing dorsally includes the mandibular or inferior dental foramen and the temporomandibular articulation. The

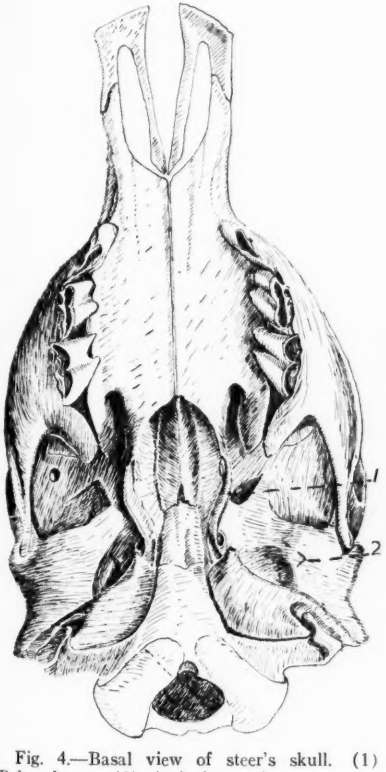


Fig. 4.—Basal view of steer's skull. (1) Palate bone. (2) Articular surface.

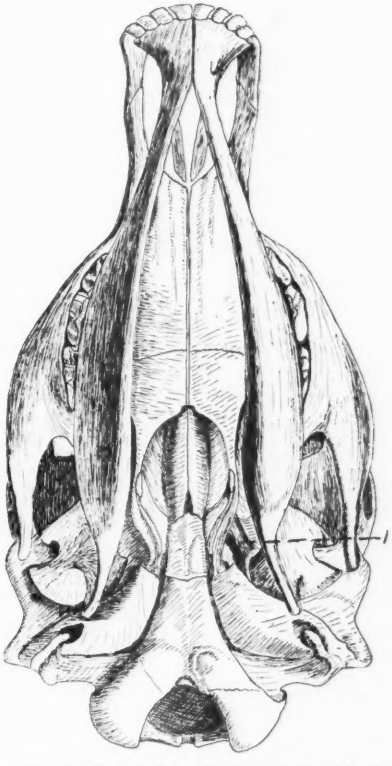


Fig. 5.—Basal view of steer's skull with the mandible in position. (1) Sphenomandibular muscle.

eminentia articularis is only indicated by a ridge, showing that but little gliding is present at this age of the condyle.

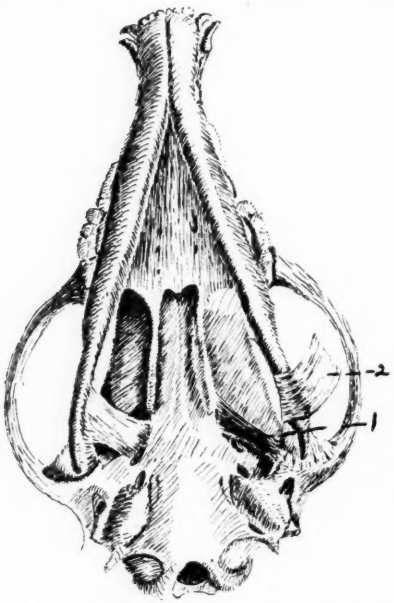


Fig. 6.—Basal view of dog's skull with the mandible in place. (1) Sphenomandibular muscle. (2) Sphenomandibular ligament reflected downwards.

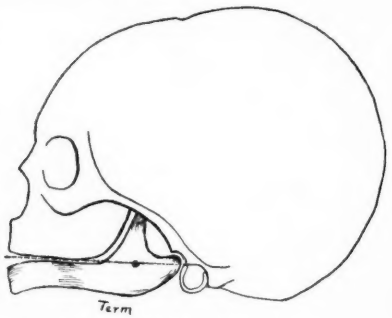


Fig. 7.—Child's skull at term.

Figure 8 is that of a child of eight months. We note that the ramus has grown vertically and that the occlusal plane does not reach the condyle but still passes through the mandibular foramen.

Figure 9 is that of a two-year-old

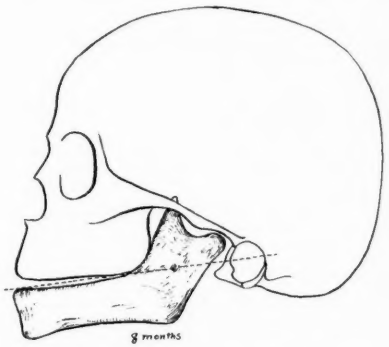


Fig. 8.—Child's skull at eight months.

child with the twenty deciduous teeth erupted. We note that the occlusal plane passes through the mandibular foramen. The same is true of the adult. This

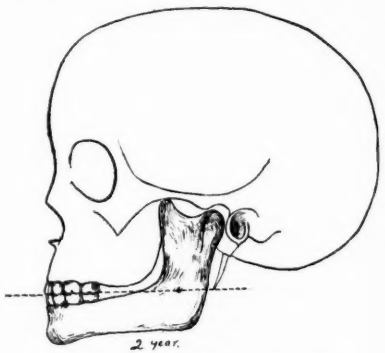


Fig. 9.—Child's skull at two years.

would indicate that the mandibular foramen is the least point of motion in the movements of the mandible so that no trauma be incurred by the mandibular or inferior dental division of the fifth cranial nerve during jaw movements.

As will be brought out, the ligamentous apparatus plus the meniscus accomplishes this result.

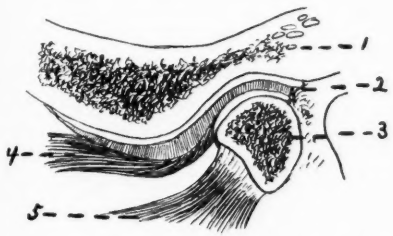


Fig. 10.—Sagittal section through adult's temporomandibular articulation. (1) Temporal bone, glenoid fossa and the articular eminence. (2) Meniscus. (3) Condyle. (4) Sphenomeniscus muscle. (5) External pterygoid muscle.

Ligaments and Meniscus—The meniscus is a fibrocartilage developed between the condyle and the temporal bone as indicated in Figure 1. This meniscus is in apposition to the eminentia articularis and glenoid fossa and presents a smooth concavoconvex surface which moves freely on the temporal surfaces. The under surface of this meniscus presents a very different appearance, (Fig. 10). Posteriorly we note a marked concavity into which fits the condyle of the mandible and from which the condyle does not escape, being confined to this apposition by a capsule as shown in Figure 10. Therefore the condyle can

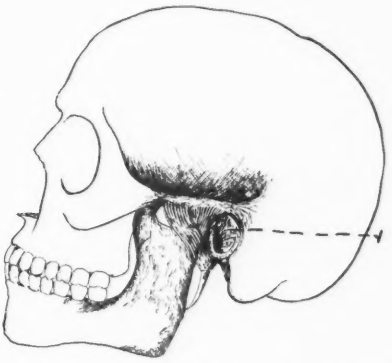


Fig. 12.—Adult's skull. (1) Lateral temporomandibular ligament.

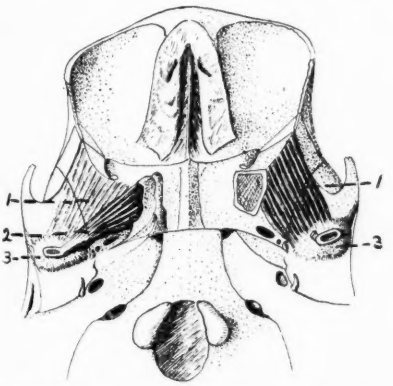


Fig. 11.—Basal view of a fragment of a human skull. Superior maxilla has been removed, on the left side pterygoid process has been removed. Condyles of mandible are present only. (1) Sphenomeniscus muscle. (2) External pterygoid muscle. (3) Capsule inclosing the capsule of the condyle of mandible.

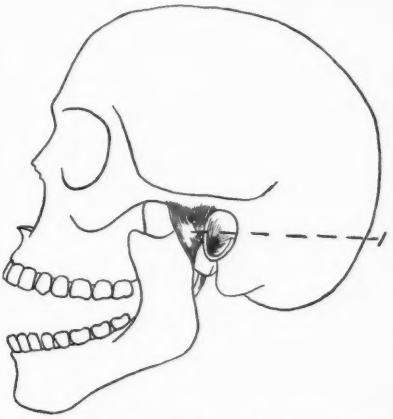


Fig. 13.—Adult's skull. Jaw opened. (1) Lateral temporomandibular ligament.

only revolve in this concavity and nothing more, being confined by the capsule. Anteriorly this surface of the meniscus gives attachment to the sphenomeniscus muscle, (Figs. 10 and 11), which mus-

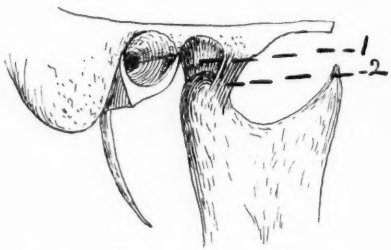


Fig. 14.—Fragment of temporal bone and ramus, with capsule intact. (1) Loose capsule. (2) Lateral temporomandibular ligament. Ramus hangs loosely.

cle drags the meniscus forward when acting with its fellow muscle of the opposite side, or forward and inward when acting alone. The concavity on the under surface of the meniscus ends abruptly in a marked shoulder, the be-

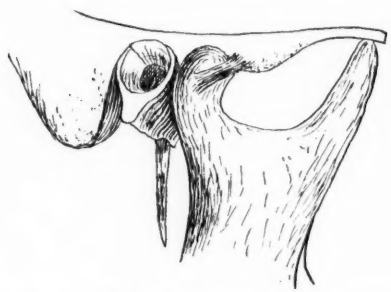


Fig. 15.—Fragment with condyle in glenoid fossa. Lateral temporomandibular ligament resisting backward displacement.

ginning of the convex under surface of the meniscus for the attachment of the sphenomeniscus muscle. Anterosuperiorly this concavity is relatively thin as compared with the vertical portion.

The result of this formation is that the condyle in moving forward with the forward pull of the meniscus does not have a decided downward displacement, due to the moving forward on the eminentia articularis or equal to the vertical diameter of the eminentia articularis but, diminished by the thinning of the meniscus resting on the posterior inferior aspect of the eminentia articularis, which naturally rests upon the eminentia articularis, between it and the condyle when pulled forward. This mechanism, of course diminishes the downward displacement of the mandibular foramen.

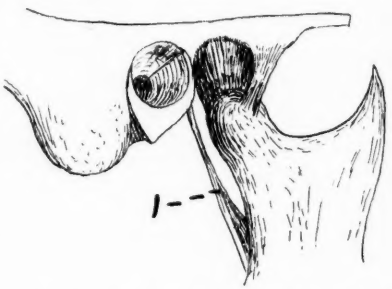


Fig. 16.—Fragment with mandible hanging loosely. (1) Stylomandibular ligament.

Ligaments—The capsular ligament and its special thickenings, the lateral temporomandibular ligament and the small medial temporomandibular ligament. Next the stylomandibular ligament, and then the sphenomandibular ligament.

Capsular Ligament—(Figs. 12, 13, 14, 15, 16 and 17). This ligament is really divided into two portions. The first portion being attached peripherally to the meniscus below, and to the periphery of the concavoconvex surface of the glenoid fossa-articular eminence above. It is limited definitely behind by the postglenoid ridge, just in front of the fissure of Glaser.

The second portion is attached to the shoulder of the meniscus, in front of the

concavity to receive the condyle, and behind and laterally is continuous with the general capsule. (Figs. 14, 15, 16 and 17).

This capsule is very thin, excepting laterally, and therefore is affected by the

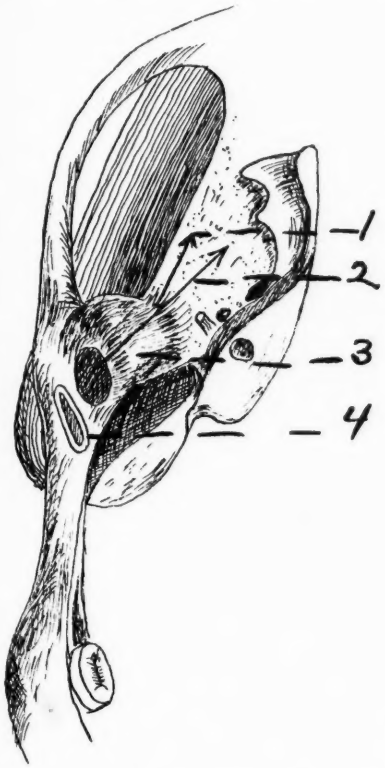


Fig. 17.—Fragment viewed from below. Mandible overstretched to show looseness of capsule. Arrows show direction of pull of the sphenomeniscus and external pterygoid muscles. (1) Sphenomeniscus direction. (2) External pterygoid direction. (3) Capsule. (4) Coronoid process removed.

air pressure in the movements of the mandible as is the case with the capsule of the knee joint, when air pressure takes a most important part in the mechanism of this joint. This looseness of the capsule necessarily permits great freedom. To resist posterior displacement, the lateral aspect of this capsule develops

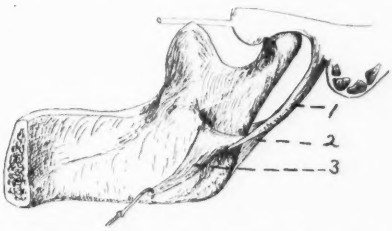


Fig. 18.—Medial view of mandible to show the stylomandibular ligament and the sphenomandibular ligament. (1) Styloid process. (2) Stylomandibular ligament. (3) Sphenomandibular ligament.

a marked thickening at the lateral temporomandibular ligament. This ligament attaches to the tubercle of the eminentia above and loses itself in the periosteum of the neck below, attaching

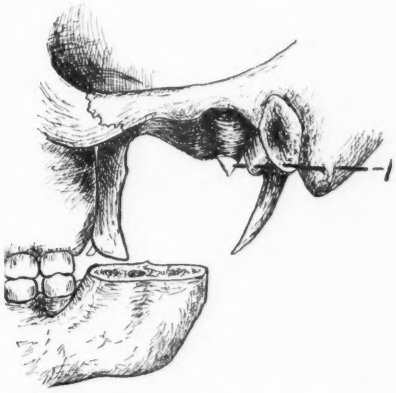


Fig. 19.—Mandible closed, ramus removed, to show spine of sphenoid, (1) at inner end of glenoid fossa.

itself in its course to a bony projection on the lateral aspect of the condyle just below this articular surface. This ligament therefore permits the condyle to

move forward freely on the eminentia articularis, remaining taut but preventing backward dislocation when the condyle is in relation to the glenoid cavity or when the jaw is closed, (Figs. 12 and 13). In other words, this ligament acts as the radius of a circle, to hold the condyle in close apposition to the meniscus and therefore to the temporal bone. Medially there is a slight thickening of the capsule, (Fig. 18), evidently resisting backward displacement also. Otherwise

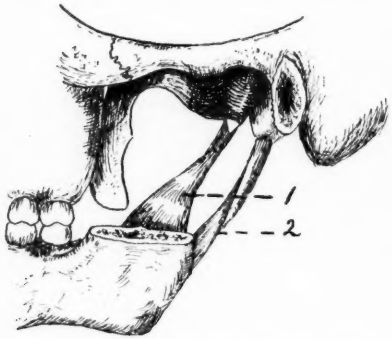


Fig. 20.—Same picture but with the sphenomandibular ligament, (1) and the stylomandibular ligament, (2) in place. Both ligaments are relaxed.

Fig. 21.—Same picture but with jaw open to show the ligaments tense.

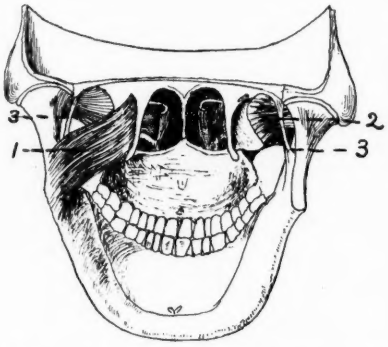


Fig. 22.—Posterior view of the base of the skull, to show on left (1) internal pterygoid, and on right, (2) external pterygoid; the internal pterygoid has been removed. (3) Sphenomandibular ligament.

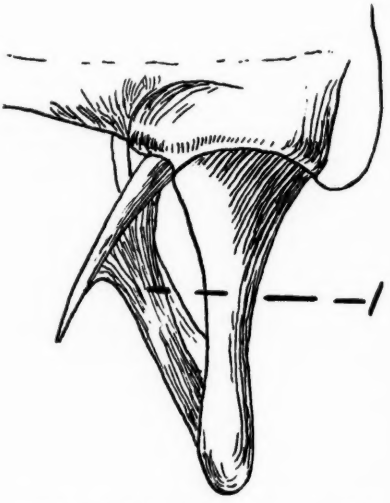


Fig. 23.—Posterior view of the ramus in the glenoid fossa. To show stylomandibular ligament medially as well as posteriorly placed, to permit of lateral motion. (1) Stylomandibular ligament.

the capsule is extremely flaccid, permitting the air to exert pressure on the soft parts, to the correct adjustment of the same with the movements of the condyle. The meniscus and the condyle are pulled forward upon the eminentia. What is the mechanism that causes the jaw to open? The answer is, the stylo-

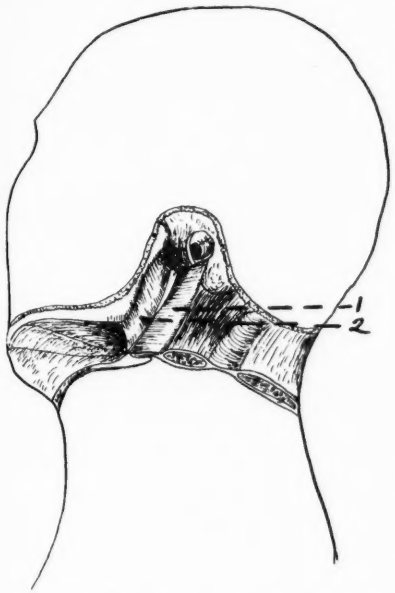


Fig. 24.—To show the vaginal fascia extending from the trapezius to the sternocleidomastoid, and then the deep layer extending from the ventral border of the sternocleidomastoid to the styloid process. (1) the stylomastoid membrane, and from the styloid process to the mandible the stylomandibular membrane. (2) The parotid gland has been removed.

mandibular ligament and the sphenomandibular ligament. These two ligaments restrain the mandible, particularily at the region of the mandibular foramen from moving forward and therefore makes this region the axis of rotation; the condyle moving forward and the angle backward. (Figs. 12 and 13).

Stylomandibular Ligament — (Figs. 16, 18, 20, 21, 23, 24, 25 and 26). This ligament is not a true ligament as discussed in most text books but part of a membrane, the stylomandibular membrane, which is thickened to resist the forward displacement of the mandible at the level of the mandibular foramen. Briefly the anatomy is explained as follows: The body of the parotid gland is located between the ramus of the mandible in front and the mastoid process and the sternocleidomastoid muscle behind. Vertically

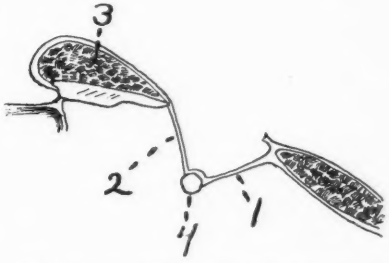


Fig. 25.—A cross section of the parotid fossa, to further explain these membranes. (1) Stylomastoid membrane in cross section. (2) Stylomandibular membrane. (3) Masseter muscle in cross section resting on the ramus of the mandible. (4) The styloid process of temporal bone.

it reaches from just below the zygomatic process of the temporal bone to a somewhat variable distance above the hyoid bone. This portion of the parotid gland is wedge-shaped with its apex reaching to the styloid process and its continuation, the stylohyoid ligament. This ligament in certain few cases is ossified as far as the lesser cornu of the hyoid bone. The fascia beneath the superficial fascia or tela subcutanea, I call the vaginal fascia. This fascia surrounds all the deep structures and sends off septa to the deeper structures. This fascia surrounds the trapezius muscle, dorsally; then at the ventral edge of this muscle blends into one fascia which ex-

tends over the deeper structures to the dorsolateral edge of the sternocleidomastoid muscle. It splits around this muscle, forming the muscle sheath and comes together at its ventral border. In the region of the parotid gland, this vaginal fascia immediately splits again to form in reality the capsule of this

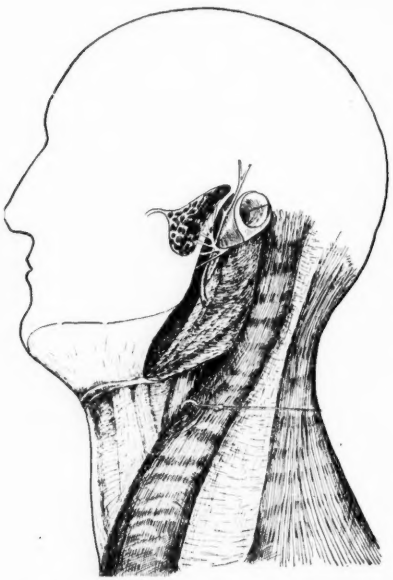
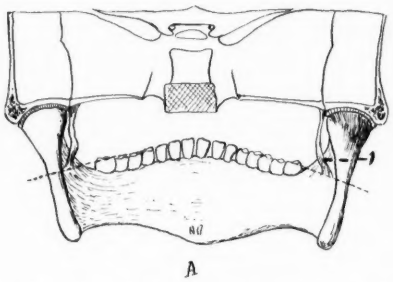


Fig. 26.—A more detailed picture of Figure 24.

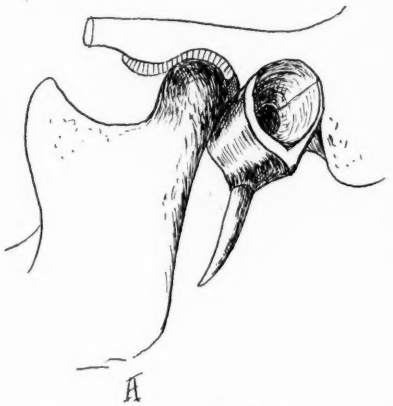
gland. The superficial layer passes over the gland to lose itself in the masseteric fascia of the face. The deep layer, passes to the styloid process and its continuation, the stylohyoid ligament, forming what I call, the stylomastoid membrane. This membrane splits around the posterior belly of the digastric and the stylohyoid muscles and permits the external carotid artery to pierce it and enter the parotid gland. The fascia then runs from the styloid process and its continuation the stylohyoid ligament to the posterior border of the ramus of the mandible, forming a definite separation between the parotid fossa and the submaxillary fossa. This membrane is



A

Fig. 27.—Posterior view of the mandible closed and therefore the condyle resting in the glenoid fossa. Note the relaxation of the (1) sphenomandibular ligament.

loose in relation to the region of the condyle of the mandible, but dense below. This dense portion is called the stylomandibular ligament. (Figs. 20, 21, 23, 24, 25 and 26). This ligament is placed



A

Fig. 27A.—Side view of Fig. 27.

posteriorly to the mandible and also towards the medial or sagittal plane. Its posterior position resists forward displacement of the angle of the jaw, as the condyle moves forward, and its

medial position permits the condyle to move medially and forward in the lateral movements.

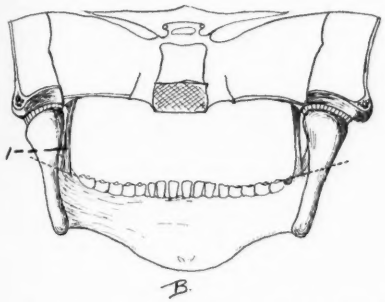


Fig. 28.—Jaw open and the condyle moved forward on the eminentia articularis. Note the (1) sphenomandibular ligament tense.

Sphenomandibular Ligament—This is built up around Meckel's cartilage of the embryo. It is a powerful plane of

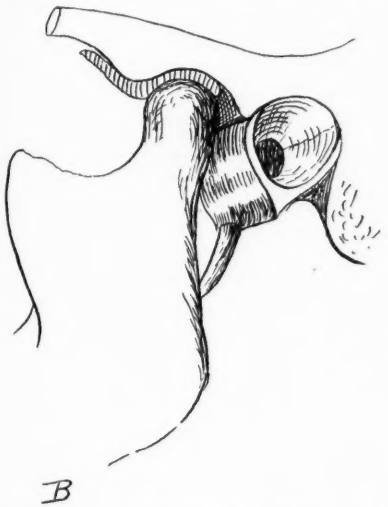


Fig. 28A.—Side view of Figure 28.

fascia triangular in shape. It attaches to the spine of the sphenoid above, directly medial to the glenoid fossa, and runs almost vertically downward spreading out into a broad attachment extending from the lingula, the small spine

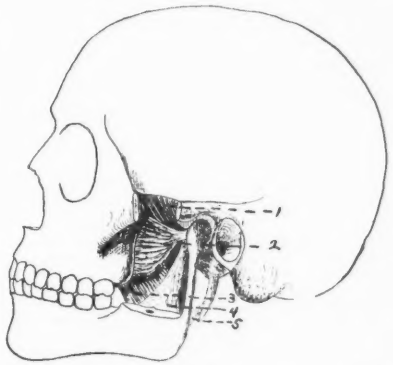


Fig. 29.—Adult skull the ramus removed excepting the condyle and the posterior border to expose (1) sphenomeniscus muscle. (2) External pterygoid muscle. (3) Internal pterygoid muscle. (4) Sphenomandibular ligament. (5) Stylomandibular ligament. The jaw is closed.

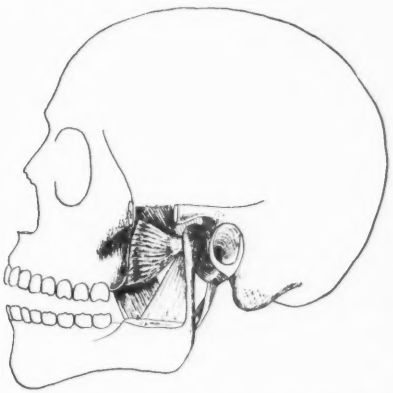


Fig. 30.—Same head but with the jaw opened, showing the tensing of the sphenomandibular and the stylomandibular ligaments.

protecting the mandibular foramen, backward to the posterior border of the mandible. (Figs. 18, 20, 21, 27 and 28).

The moment the condyle is pulled forward onto the eminentia articularis, this ligament tightens, thus preventing unnecessary downward displacement of the condyle and therefore of the mandibular foramen. Therefore the condyle is supported medially and laterally by two ligaments, the temporomandibular and the sphenomandibular. The former is a true ligament of the capsule, resisting lateral movement, while the latter is a long ligament, not immediately related to the capsule and permits movement of the condyle medially as it swings forward

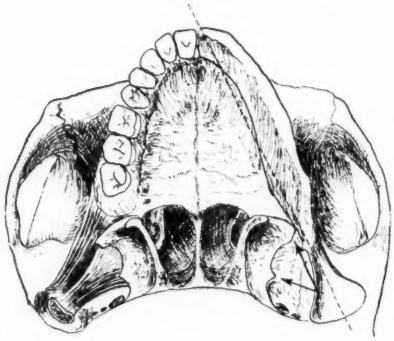


Fig. 31.—Basal view of skull with dotted lines showing the sections made in Figures 32 and 33.

in the process of opening the jaw. If the sphenomandibular ligament were a short powerful ligament like the temporomandibular and also a part of the capsule, a marked restriction of movement would result, particularly of the lateral type, and adjustment of the condyle to the meniscus would be interfered with. Incidentally, this sphenomandibular ligament is incorporated in the fascias of the two pterygoid muscles (Fig. 38).

Motive Power—The essential muscles in the mechanism of opening and closing the jaw and producing lateral motion are: The sphenomeniscus muscle, the external pterygoid and the internal pterygoid muscles. These three muscles can carry on all these motions and all other muscles are accessory. The anterior belly of the digastric and the mylohyoid, undoubtedly assist the sphenomeniscus

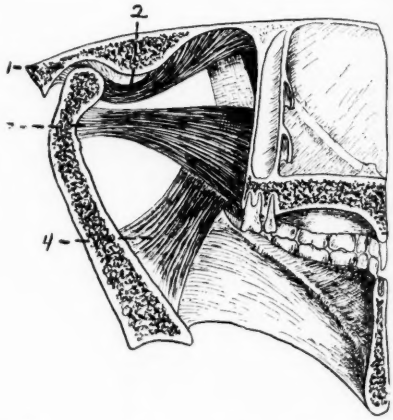


Fig. 32.—Medial view of section. (1) Meniscus. (2) One-half of sphenomeniscus muscle. (3) External pterygoid. (4) Internal pterygoid.

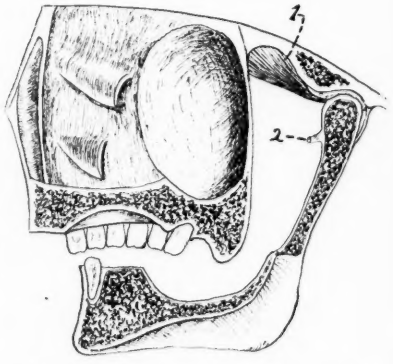
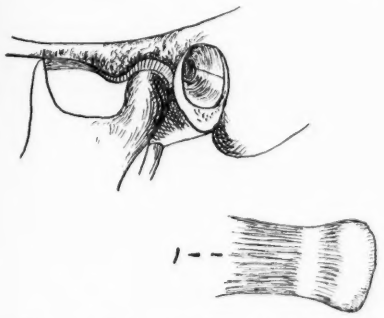


Fig. 33.—Lateral view of section. (1) Other half of the sphenomeniscus muscle. (2) A bit of the tendon of the external pterygoid.

muscle and the external pterygoid in the opening of the jaw and the masseter and temporal assist the internal pterygoid in closing the jaw. In reality the particular

function of these last named muscles is to increase the power in biting and grinding.

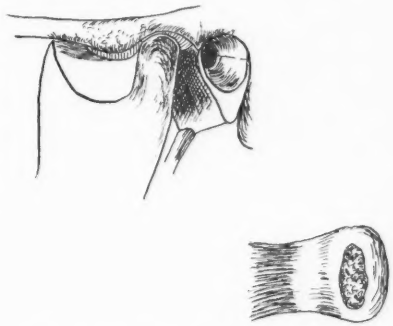
The Openers of the Jaw—Sphenomeniscus and the external pterygoid. The sphenomeniscus (Figs. 11, 22, 29, 30, 31, 32 and 33) which is present in the lower types is a broad muscle attached to the under surface of the great wing of the sphenoid. It runs backward, and somewhat downward and outward, passing over a smooth surface in a direction practically at right angles to the emi-



Figs. 34 and 34A.—Fig. 34, Jaw closed normal condition. Fig. 34A, View looking down on meniscus and (1) sphenomeniscus muscle attached.

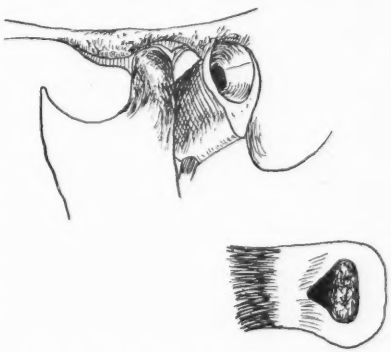
nentia articularis, (Figs. 11, 32 and 33) and inserts into the capsule and under surface of the meniscus as far back as the shoulder, where the capsule of the condyle-meniscus joint occurs, (Fig. 10).

This muscle acts upon the capsule and the meniscus and not directly on the mandible. By its action it tends to open the jaw and produce lateral motion. Being present in the lower forms, it occurs to me, that this muscle is the interesting muscle to the prosthetists, as it not only indirectly opens the jaw, but produces directly a lateral movement. The external pterygoid is the muscle attached to the lateral surface of the broad external pterygoid plate. It is a single-bellied muscle and not a double-bellied muscle, the other head as described in the texts being the sphenomeniscus muscle. The external pterygoid muscle (Figs. 11, 29, 30, 31, 32 and 33) is a fan-



Figs. 35 and 35A.—Jaw closed but with the meniscus fenestrated due to pressure atrophy.

shaped muscle arising from the outer surface of the external pterygoid plate and converges into a tendon which inserts into the depression on the anterior surface of the neck of the condyle, called



Figs. 36 and 36A.—Fig. 36, Jaw pulled forward by the sphenomeniscus muscle. Fig. 36A, Imaginary distortion of the fenestrated meniscus, thus increasing the loss of equilibrium.

the fovea pterygoidea. This muscle is practically at right angles to the sphenomeniscus, being placed in a nearly vertical plane, while the sphenomeniscus mus-

cle is almost in a horizontal plane. This pterygoid muscle on account of its origin, passes backward, upward and decidedly outward. It tends to pull the condyle downward as well as forward thus overcoming the resistance of the eminentia articularis. This muscle directly opens the jaw, by pulling the condyle forward, while the angle moves backward due to the ligaments restraining the mandible at the region of the mandibular foramen, (Figs. 29 and 30).

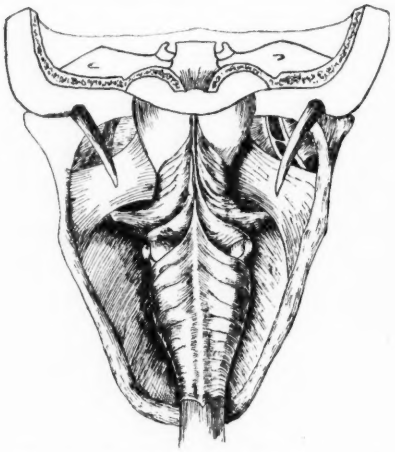


Fig. 37.—Posterior view of the pharynx attached to the skull and the mandible. Mandible markedly depressed. (1) Internal pterygoid muscles. On the left the fascias of the pterygoids are in place. Showing how the sphenomandibular ligament is intimately related to these muscles.

The internal pterygoid, (Figs. 22, 29, 30, 32 and 37) is a broad short muscle arising from the inner surface of the external pterygoid plate, and the pterygoid fossa, below the scaphoid fossa. This muscle runs downward, backward and outward to insert into the inner surface at the junction of the ramus and the body of the mandible at the region of the angle. This muscle pulls upward and forward thereby closing the jaw, (Fig. 32). Being placed medially, it also causes lateral motion. The two muscles acting together cause a combined lateral motion. Owing to the cusps of the teeth interlocking, opening and closing of the jaw is necessary also. Therefore since lateral motion is produced by both mus-

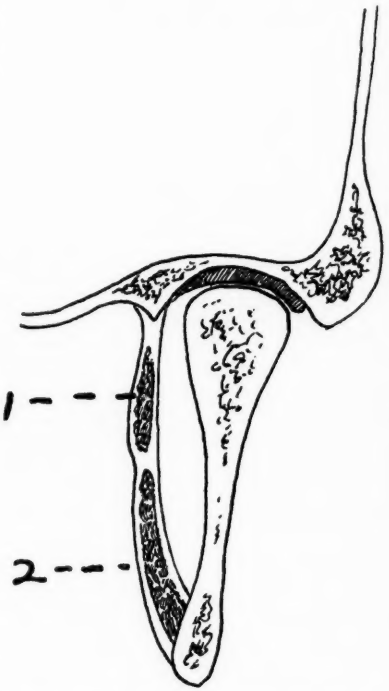


Fig. 38.—A verticle section through the ramus and the two pterygoids to show how the sphenomandibular ligament is a part of the general fascia. (1) External pterygoid. (2) Internal pterygoid.

cles, the two muscles have to correlate in tension and relaxation alternately, otherwise the jaws would be locked. I believe these muscles from my argument are the muscles which concern the prosthetist and particularly the sphenomeniscus muscle, in relation to the small amount of motion concerned in the grind-

ing act. The true external pterygoid is more concerned with opening the jaw.

In an article in the *Dental Cosmos,* June, 1918, I called attention to the absorption of the meniscus, in various degrees, due to the loss of teeth. It of course is the loss of those teeth which permit the pull of the masticatory muscles to bring pressure of the condyle against the meniscus. The degree of destruction varies. The meniscus may be thinned out by the pressure atrophy, perforated, from a small perforation, to a complete destruction of that portion of the meniscus against which the condyle abuts. Again the condyle and also the glenoid cavity may present bony atrophy, following destruction of the meniscus. This of course causes great irregularities between the opposed bony surfaces.

With this loss of tissue and bearing in mind that the sphenomeniscus muscle, a relatively large and powerful structure is attached to the meniscus broadly, (Figs. 10, 11, 32 and 33) we can imagine that the action of this muscle on the impaired meniscus, can produce still greater deformity in the articulation (Figs. 34, 34A, 35 and 35A). In these figures I have drawn imaginary conditions. The deformities were sketched however from actual specimen. Figure 34 shows the side view of the articulation, the capsule being removed, while Figure 34A shows a view from above looking down on the meniscus which was injured.

Figures 35 and 35A are similar arrangements but with a destruction of the meniscus.

Figures 36 and 36A show the condyle pulled forward but due to the pull of the sphenomeniscus muscle on the impaired meniscus, the aperture in the meniscus is elongated, thus increasing the deformity and therefore interfering with the hoped-for results on the part of the prosthetist. In other words, if any destruction of the meniscus occurs, either a thinning or a fenestration, when the operator completes his dentures, the temporomandibular joint is not impaired, not only as far as the meniscus is concerned, but also as to the sphenomandibular, stylomandibular and temporomandibular ligaments. Because as the mandibular condyle approaches more closely the temporal bone surface, these ligaments are relaxed and therefore the equilibrium of the joint is lost, all tending to impair the results desired by the practitioner. One may speculate as to what may happen to the joint after the denture is completed. Because of the extreme flaccidity of the capsule and the air pressure, the soft tissues may be crowded together, as the mandible is separated when full dentures are introduced and ultimately a condition simulating the normal may result. I should imagine that cases are rare where the patient and the practitioner are both satisfied with the immediate results; time must be considered for adjustment in the joint to take place. If such occurs, I should say that the practitioner can then receive his just dues with no qualms.

A CLINICAL AND EXPERIMENTAL STUDY IN CHRONIC ARTHRITIS[1]

By JOHN G. MEISSER, D.D.S., and SAM BROCK, M.D., Rochester, Minnesota

(Read before the American Dental Association, Cleveland, Ohio, September 10-14, 1923)

OF THE various diseases attributed to focal infection, none has received more attention than chronic arthritis. It is commonly associated with oral sepsis, and it is more easily recognized by the dentist than almost any other systemic involvement; therefore his opportunities for studying the causal relationship of the two conditions are numerous. His acceptance of the theory that infections in and around teeth are often the cause of various systemic disorders is based largely on results obtained in treating patients with chronic arthritis. Although many such patients have improved remarkably, following extraction of infected teeth, many others, unfortunately, have not.

Numerous articles have been written on chronic arthritis, usually based on clinical or pathological findings. These findings have led to various classifications of the disease; the three in general use are that of Nichols and Richardson, who divided their cases into proliferative and degenerative, that of Goldthwait, Painter and Osgood, who divided their cases into infectious, atrophic and hypertrophic, and that of English investigators, who divided their cases into the rheumatoid and osteoarthritis. These classifications are similar in many respects. The proliferative and degenerative types of Nichols and Richardson correspond to the atrophic and hypertrophic types of Goldthwait, Painter and Osgood, except that the latter added a third group to their list, which included patients whose arthritis was apparently the result of infection. Of late, certain investigators have grouped the proliferative or atrophic type with the infectious, but believe that the degenerative, hypertrophic or osteoarthritic cases are in no way related to infection. This conclusion is reached by many clinicians and pathologists because the clinician often fails to locate foci of infection, or if foci are located and removed, recovery seldom follows, and because the pathologist is often unable to demonstrate bacteria in this type of joint infection.

In the hope of determining the relationship between the various forms of chronic arthritis and foci of infection, particularly dental foci, and the prospect of improvement following their removal, we selected for study a group of seventy-five cases of arthritis. All cases of acute rheumatic fever, and cases that develop during or directly following dysentery, scarlet fever, gonorrhea, syphilis, and so forth, were omitted. In fifty-five of the seventy-five cases, infected teeth were found, and these only will be considered here, since they will be of greatest interest to dentists. A detailed report of all the cases will be published elsewhere.

As nearly as possible our cases are divided into proliferative and degenerative, according to the classification of Nichols and Richardson, and our differential diagnosis is based on roentgenographic findings and clinical symptoms. Proliferative and degenerative arthritis have been described pathologic-

[1]Work done in the Division of Experimental Bacteriology and Section on Orthopedic Surgery.

ally, accurately and comprehensively by Nichols and Richardson.

Proliferative Arthritis—Briefly, proliferative arthritis is the result of (1) proliferation and extension of the synovial membrane over the articulating cartilages, (2) disintegration and destruction of cartilage, sometimes so great that the articulating ends of the bone are covered only by the synovial pannus; and (3) ankylosis of the adjacent joint surfaces (Fig. 1); both bones may unite with a continuous bony marrow.

There are no hard and fast rules of

Fig. 1.—Bony ankylosis of joints in fingers and hands from advanced proliferative arthritis.

differentiation in the clinical course of cases of proliferative and degenerative arthritis. The onset in the proliferative type usually is more acute, and the progress of the disease is accompanied by more or less severe exacerbations. The temperature may be slightly elevated, and the affected joints may present all the signs of acute or subacute inflammatory reaction. The process may be confined to one or more joints for a variable length of time, but it tends toward polyarticular bilateral involvement.

Degenerative Arthritis—This type, as a rule, is insidious, and pursues a slow progressive course without definite exacerbations and without marked constitutional symptoms. There is little tendency toward rapid involvement of the joints. The joint cartilage is destroyed, but true ankylosis never occurs. The exposed ends of the bone may be in indirect contact with one another, or

Fig. 2.

Fig. 3.

Figs. 2 and 3.—Destruction of articulating joint surfaces from degenerative arthritis.

the exposed end of one bone may be in contact with the articulating cartilage of the other. Since the changes in the joint are often very irregular, a false ankylosis sometimes takes place by the interlocking of the two surfaces (Figs. 2 and 3). A certain amount of motion,

however, is retained in all cases of false ankylosis.

In certain cases we found that the onset and progress of both the proliferation and the degeneration were so similar clinically that without changes in the joints observed roentgenographically, it was often impossible to differentiate them. Nathan has shown that both phenomena often occur in the same joint but that one or the other usually predominates. Therefore, in making the differential diagnosis in our cases, we depended largely on roentgenographic evidence, grouping our cases according to the predominating phenomenon. The cases in which no changes were demonstrable in the joints were grouped separately.

Seventeen of the fifty-five cases were classified as proliferative arthritis, seventeen as degenerative arthritis, five as spondylitis, and sixteen were not classified, having no changes in the joints. In 65 per cent, the onset of the disease occurred in the third and fourth decades of life (Table 1). It is of interest that the period of greatest incidence in the degenerative type, and in the type in which joint changes were not evident in roentgenograms, falls within the same decade of life.

The duration of the disease before our examination of the patients varied considerably. Twelve (22 per cent) of them were examined less than two years after the onset, and thirty-one (56 per cent), within five years after the onset. Twenty-eight of the fifty-five patients (51 per cent) had been treated before coming to the Clinic; twenty-two had had the tonsils removed; three, infected teeth, and three both infected teeth and tonsils. Only eight per cent (29) of this group improved; but six of the eight had a recurrence within a short time after the foci were removed. One patient continued to improve, and in one the disease was checked. In four of the eight patients, joint changes were not evident in the roentgenogram.

Forty-eight patients (87 per cent) were growing progressively worse at the time of our examination. Six (11 per cent) remained in the same condition; only one was improved (Table 2).

The twenty-two patients whose tonsils had been removed all had infected teeth; no dental examination had been made. Only six of the twenty-eight patients previously treated had been referred to dentists, but in none of these were all infected teeth removed. Three of the six harbored infected tonsils as well as infected teeth.

In previous studies (4) and (5) we demonstrated that in many mouths the pulpless, roentgenographically negative teeth harbor the same type of bacteria with the same elective affinity for tissues of animals as do the teeth showing definite evidence of periapical infection.

TABLE 1

AGE INCIDENCE AT ONSET OF DISEASE

	Negative roentgenograms		Proliferative arthritis		Degenerative arthritis		Spondylitic arthritis		Total	
	patients	per cent	patients	per cent	patients	per cent	patients	per cent	patients	per cent
1-10 years	0	0	0	0	1	6	0	0	1	2
11-20 years	3	19	3	18	2	12	0	0	8	15
21-30 years	9	56	2	12	7	41	3	60	21	38
31-40 years	3	19	7	41	3	18	2	40	15	27
41-50 years	1	6	2	12	3	18	0	0	6	11
51-60 years	0	0	3	18	1	6	0	0	4	7
61-70 years	0	0	0	0	0	0	0	0	0	0

TABLE 2

CONDITION OF PATIENTS ON THEIR ARRIVAL AT THE MAYO CLINIC

	Negative roentgenograms		Proliferative arthritis		Degenerative arthritis		Spondylitic arthritis		Total	
	patients	per cent	patients	per cent	patients	per cent	patients	per cent	patients	per cent
Worse	16	100	15	88	14	82	3	60	48	87
Stationary	0	0	2	12	2	12	2	40	6	11
Improved	0	0	0	0	1	6	0	0	1	2

However, such apparently negative but pulpless teeth were removed only when it seemed advisable to remove every possible focus. The percentage of such teeth that are infected in the average healthy person remains an open question.

One hundred thirty-four teeth revealed definite evidence of periapical infection in roentgenograms. The root-canals had been filled in 111, and the remaining twenty-three had putrescent pulps. Sixty-two pulpless teeth revealed only questionable areas, or were entirely negative in the roentgenograms. Cultures were made whenever possible (Table 3).

Certain teeth, because of their location, could not be cultured. Of 132 cultures, ninety-four yielded pure cultures of green-producing streptococci. If cultures were contaminated by bacteria from the mouth, they would probably be grouped under the headings, green-producing streptococci and staphylococci, or streptococci, staphylococci, and gram-positive and gram-negative gas-producing bacilli (Table 3). However, a mixed culture does not necessarily mean contamination. Of the forty-five pulpless teeth that were apparently negative in the roentgenogram, thirty-two yielded pure cultures of streptococci. Cultures were obtained in seven cases from only apparently negative but pulpless teeth, and, when injected into animals, pro-

TABLE 3

BACTERIOLOGIC STUDY OF INFECTED TEETH IN FIFTY-FIVE CASES OF CHRONIC ARTHRITIS

	Condemned	Cultured	Results of cultures		
			Green-producing streptococci	Green-producing streptococci and staphylococci	Streptococci, staphylococci, and gram-positive and gram-negative gas-producing bacilli
Pulpless teeth with evidence of infection in roentgenograms	111	62	42	17	3
Pulpless teeth either questionable or without evidence of infection in roentgenograms	62	45	32	12	1
Teeth with putrescent pulps	23	16	12	3	1
Teeth with extensive pyorrhea	9	2	2	0	0
Teeth with extensive caries	2	2	2	0	0
Roots	6	2	1	1	0
Residual granulomas	2	2	2	0	0
Total	217	132	94	33	5

duced arthritis in every case. In many other cases, cultures from similar teeth produced arthritis in animals, but in such cases the patients harbored other infected teeth. The technic employed in isolating bacteria and injecting animals was the same as that employed by Rosenow in his studies on elective localization (8) and (9).

We injected 175 rabbits intravenously with the cultures obtained from the infected teeth of patients variously afflicted with arthritis (Table 4).

Forty-four rabbits were injected with cultures from the infected teeth of sixteen patients without evidence of joint changes in the roentgenograms. Arthritis developed in 77 per cent, and myositis in 34 per cent; relatively slight lesions developed in other organs. The animals injected with bacteria from infected teeth of patients with proliferative and degenerative changes did not show such marked localization in joints and muscles, but in comparison with lesions in other organs, a very evident relationship was demonstrated.

Myositis is a common symptom in cases of chronic arthritis; many of our patients had had muscular pains. In many experiments the localization in the muscles of rabbits was relatively high (Table 4).

In cases in which excellent experimental results were obtained, autogenous vaccines were made for a certain number of patients in each group in order to compare end results. Questionnaires were sent to all patients who had been at the Clinic from one and a half to two years previously, to ascertain whether they had been benefited by the removal of foci, or by the removal of foci and vaccine treatment. Replies were received from forty-five (82 per cent). The remaining ten could not be traced (Table 5).

Seventy-one per cent of the patients without evidence of joint changes in the roentgenograms improved; in the remaining 29 per cent the progress of the disease was arrested. Results were less satisfactory in patients with evidence of joint changes in the roentgenograms. Only 54 per cent of those with proliferative arthritis, and 35 per cent of those with degenerative arthritis improved. The progress of the disease was arrested in 23 per cent of the patients with proliferative arthritis and in 29 per cent with degenerative arthritis. The remaining patients (23 per cent in the

TABLE 4

RESULTS OF INOCULATION OF ANIMALS WITH CULTURES FROM INFECTED TEETH IN CASES OF CHRONIC ARTHRITIS

	Cases	Animals Injected	Percentage incidence of lesions in					
			Joints	Muscles	Kidneys	Stomach	Endocardium	Myocardium
Joints negative in roentgenograms	16	44	77	34	7	2	0	0
Proliferative arthritis	17	58	60	29	2	7	0	0
Degenerative arthritis	17	60	55	27	15	6	2	3
Spondylitis	5	13	69	6	0	2	0	0

proliferative group, and 36 per cent in the degenerative group) grew progressively worse after removal of foci. One of the four patients with spondylitis improved, one remained in the same condition, and two were worse after the removal of foci.

TABLE 5

CONDITION OF PATIENTS FROM ONE AND ONE-HALF TO TWO YEARS AFTER REMOVAL OF FOCI

	Improvement		Total No.			
	Definite	Slight	improved	No change	Worse	Total
	per cent	per cent	per cent	per cent	per cent	per cent
Joints negative in roentgenograms	50	21	71	29		29
Proliferative	31	23	54	23	23	46
Degenerative	28	7	35	29	36	65
Spondylitis	25		25	25	50	75

Autogenous vaccines were made for seven patients without evidence of joint changes in the roentgenogram; five improved. Twelve patients with either proliferative or degenerative changes in the joints received autogenous vaccines following removal of foci of infection, and only three improved.

REPORTS OF ILLUSTRATIVE CASES

Case I (A287393). Mrs. R. R., came to the Clinic September 1, 1919. She had had a severe attack of pneumonia in February, 1912, which resulted in general debility. In April, she had noticed a slight swelling of several of the finger joints in both hands. In July, following slight chills and fever, the arthritis progressed rapidly, involving other joints of the hands, and the right elbow. The patient then spent six weeks at Hot Springs, Arkansas, and recovered entirely. The next year she was under great mental and physical strain for many weeks while nursing a sick sister, and the joints of her hands became affected, but they cleared up again after treatment at Hot Springs. During the winter of 1914, she taught in a cold schoolhouse, and the following May the joint symptoms recurred, associated with chills and fever. The right elbow had become slightly ankylosed. She went to Hot Springs a third time, but received little relief. Arthritis now progressed rapidly, involving both shoulder joints, ankles, knees, and left hip. Again she visited Hot Springs, but was only slightly benefited. In June, 1916, her tonsils were removed, and a very severe reaction followed, lasting for five days. Improvement was then rapid, and within two months the patient gained 25 pounds in weight. She was free from pain in all joints, except the right elbow. Following a severe cold about six months later, there was a return of all joint manifestations. Soon after she developed influenza, and the arthritis became rapidly worse. A change of climate was tried without benefit. About this time two abscessed teeth were causing considerable trouble. She visited a dentist who found nearly all her upper teeth to be infected. These were extracted, a few at a time, and after each extraction the patient suffered a severe reaction in all the affected joints. Again improvement was very definite, except in certain joints already enlarged and ankylosed. The improvement, however, was of short duration and the joints again became progressively worse.

Examination—The patient was in a helpless condition. She was hospitalized, and two weeks later she could scarcely move without suffering excruciating pain in all the affected joints. Her temperature was normal. The joints of hands and fingers were markedly swollen, the skin tense and glossy. The middle phalangeal joints of the left hand, and the metacarpophalangeal joints of both hands were partially dislocated (Fig. 1). Motion of the right elbow joint was limited to 100 degrees flexion and extension; abduction of the arms was impossible; circumduction of the shoulder joints was markedly limited; motion in the left hip, in both knees, and in the ankles was somewhat limited and very painful. There was partial ankylosis of the cervical and dorsal spine, and paresthesia in both forearms, hands, and over the anterior portion of the chest. All reflexes were exaggerated. Roentgenograms of the jaws revealed evidence of periapical infection in the lower first and second molars, both of which were

pulpless. The patient could open her mouth only about one-third its normal extent. The diseased teeth were extracted, but cultures could not be made. The left antrum was found to be infected. A Dinker operation was performed and cultures were made from the pus in the antrum. The green-producing streptococcus was the predominating organism in all the cultures. Several rabbits were injected intravenously, and all developed very marked multiple arthritis, but no other lesions. One and one-half years later, the patient's condition had not improved; it had become progressively worse.

Case 2 (A364828). Mrs. M. W., aged forty-three years, came to the Clinic July 14, 1921. Eighteen years before, she had noticed gradual stiffening, with loss of motion, in the finger joints of both hands. The process advanced so slowly that the loss of function in the affected joints was scarcely noticeable. Ten years after the onset of the disease, the proximal phalangeal joints had become dislocated, resulting in ulnar deflection. The finger joints, the temporomaxillary joints, the elbow joints and the spine had become involved, in sequence, over a period of many years. Two years before the onset of the disease, the patient had developed a periapical abscess on the upper left central incisor. After treatment for three months the root-canal was filled. During the next few years, five other teeth were rendered pulpless. In 1905, the patient developed an infection in the right antrum. Her tonsils had been removed six years before coming to the Clinic, but the progress of the disease was not arrested. There had always been a tendency toward constipation, but her general health had been good.

Examination—The skin of the forearms and the hands was dry and atrophic. The joints of the fingers were markedly deformed (Figs. 4 and 5), there was ulnar deflection, free lateral motion, with crepitation, in several finger joints, and a false ankylosis of both wrists and the left elbow. The other joints were normal. Periapical infection was found in the six pulpless teeth. They were removed, and the apices of three were cultured. Two yielded pure cultures of green-producing streptococci, the others streptococci and staphylococci. Five rabbits were injected with these cultures, and four of the five developed marked arthritis, which in one was associated with myositis. The fifth rabbit developed myositis only. The joints of the rabbits with arthritis were distended, and contained an excessive amount of thick, turbid fluid.

The streptococci were recovered in pure culture from the joint fluid. An autogenous vaccine was made and injected once a week for a period of several months, but no improvement was noted while the patient was under our care. In answer to a letter one and one-half years later, she said that the condition of her joints had not improved since the removal of her infected teeth.

Fig. 4.

Fig. 5.

Figs. 4 and 5.—Characteristic deformity of hands in cases of degenerative arthritis.

Case 3 (A377721). Miss C. E. H., aged forty-nine years, was examined in the Clinic November 21, 1921. Arthritis had begun about five years before, with swelling and pain in the joints of the hands and the knees, following the treatment of a root-canal in one of her teeth. After the root-canal had been filled, the tooth became very painful and caused swelling in the jaw. Later, the ankle joints became involved. Various patent medicines were taken without benefit.

Examination—The patient's general health was good. Although certain joints were swollen and painful, roentgenograms showed no evidence of destruction or bony changes. Roentgenograms of the jaw revealed evidence of infection at the apices of four pulpless teeth and around one root that had remained since a previous extraction. These were removed, and cultures made from the apices of two of the teeth. Both yielded pure cultures of green-producing streptococci. Five rabbits were injected with these cultures, and all developed marked multiple arthritis; two also had mild myositis, and one a few small lesions in the medulla of the kidney. Within a few weeks after the removal of the teeth, the patient improved markedly. One year and a half later she had practically recovered from the arthritis.

Case 4 (A220008). Miss C. G., aged forty-five years, came to the Clinic January 24, 1918. In 1917, the patient had had severe sore throat, and a few days later acute mastoiditis, for which an operation was performed. At examination a diagnosis of chronic cholecystitis was made. The gall-bladder, which contained a large number of stones, was removed. Roentgenograms of the patient's jaws revealed evidence of periapical infection in seven teeth. She was advised to have these extracted after returning home. Seven months after cholecystectomy, the finger joints became painful and swollen; then the ankles, knees, shoulders, and hips became involved. The arthritis was always worse when the patient was very tired. Weather changes, especially cold, damp weather, had aggravated the symptoms. The patient tired easily, felt exhausted most of the time and had become very nervous.

Examination—She returned to the Clinic September 3, 1921, because the arthritis was growing progressively worse. The joints of the fingers, ankles, and knees were slightly enlarged. From changes revealed by the roentgenograms, a diagnosis of proliferative arthritis was made. The patient still harbored the seven infected teeth that we had advised having removed more than three years before. Her tonsils appeared slightly septic. The infected teeth and tonsils were removed and cultured. Green-producing streptococci were recovered either in pure culture, or as the predominating organism in all the cultures. Nine rabbits were injected intravenously with cultures from the teeth. Six developed arthritis, three myositis, one a few hemorrhagic lesions in the stomach, and one a few small lesions in the medulla of the kidney. Only two rabbits were injected with cultures from the tonsils, and one developed arthritis. An autogenous vaccine was made. The patient traveled considerably, and we were unable to trace her afterward.

Summary and Discussion

We have studied fifty-five cases of chronic arthritis, including various types. The clinical history of the onset and progress of the disease in patients without evidence of joint changes in roentgenograms, was so similar to the early history of patients with proliferative or degenerative changes, that we believe it to be but an early stage of the disease. Foci of infection were present in all the patients (including those previously treated) when they arrived at the Clinic.

The results in animals demonstrate the existence of a definite relationship between the dental foci and the various types of the disease. Our highest percentage of localization was obtained in rabbits injected with bacteria isolated from infected teeth of patients without evidence of joint changes in the roentgenogram. This is probably explained by the fact that these patients were more acutely affected than those with proliferative and degenerative changes, 63 per cent having had the onset less than three years before coming to the Clinic.

The results obtained one and one-half to two years after the removal of every focus that could be found are of special interest when compared with results of previous treatment. More than half the patients studied had had certain foci removed before coming to the Clinic. Only eight had improved, six of whom had a recurrence of the disease within from a few months to a year after these foci had been removed. All the patients without evidence of joint changes in the roentgenogram were growing progressively worse when they came to the Clinic. From one and one-half to two years later 71 per cent were improved, and in the other 29 per cent the progress of the disease was arrested. Fewer of the patients with proliferative and degenerative ar-

thritis improved than in the early cases; the results, however, were very much better than had been obtained previously.

Eighty-eight per cent of the patients with proliferative arthritis, and 82 per cent with degenerative arthritis, were growing progressively worse when they came to the Clinic. From one and one-half to two years later, only 23 per cent of those with proliferative arthritis, and 36 per cent with degenerative arthritis, were growing worse. In all others, the progress of the disease had been arrested, or improvement had occurred. There were so few cases of spondylitis that they can hardly be considered on a percentage basis.

Nichols and Richardson have shown that articular cartilage is rarely restored, and in cases where it does proliferate, there is a tendency to accentuate deformities already produced. In advanced cases, therefore, the prognosis cannot be favorable. The removal of primary foci will prevent reinfection, but will not correct mechanical interference with joint function.

We found that autogenous vaccines were of little or no value in the treatment of chronic arthritis. If joint changes were not evident in the roentgenogram, improvement followed removal of foci alone, and if destruction of joint tissues had taken place, the autogenous vaccine had no effect, findings which corroborate those recently published by Billings and Coleman and Hibbs.

In seven patients, we could find no other foci than several pulpless teeth that were apparently negative in the roentgenogram. Cultures from the apices of these teeth produced arthritis when injected into animals. In several other patients, cultures from similar teeth produced arthritis when injected into animals, but these patients also harbored teeth showing definite evidence of periapical infection. We believe, therefore, that if there is a definite relationship between the patient's disease and a focus of infection, the removal of all pulpless teeth is justified, and the importance of removing every possible focus before the disease has advanced to an incurable stage cannot be over-emphasized. In Case 1 the history is interesting. The patient improved remarkably after the removal of infected tonsils and again after the removal of many infected teeth, but each time the disease recurred during periods of lowered resistance. The patient was brought to the Clinic, helpless. Examination revealed an infected antrum and several infected teeth. That the bacteria in the infected antrum had an elective affinity for joint structures and was acting as a focus, is demonstrated by results obtained in animals. We believe that if this patient had had all foci removed during the early stage of the disease (at which time only infected tonsils were removed) she would not be confined to her bed and a wheel chair as she is today.

Very often search for foci of infection in patients with chronic arthritis ends with an examination of the mouth or throat, as is shown by the number of foci still present in the 51 per cent of our patients who had been treated before coming to the Clinic. Foci are sometimes present in parts of the body other than the head or throat. One patient who had had infected tonsils and teeth removed, had an infected cervical gland. From this gland we recovered green-producing streptococci which caused arthritis when injected into animals. From another patient streptococci that had an elective affinity for joints in animals were recovered from the stool. Several of the patients associated the exacerbation of joint symptoms with endocervicitis. Dr. Moench, who studied the focal relation of endocervicitis to arthritis in a number of our patients, recovered streptococci from the cervical tissues and discharge which had an elective affinity for joint structures of

animals. In Case 4, many factors may have influenced the progress of the disease. This patient had seven infected teeth, infected tonsils, an infected antrum and mastoid, cholecystitis, and endocervitis, and had been constipated for twenty years. To remove only the infected teeth in many such patients is but a part of the treatment.

Our clinical and experimental investigation demonstrates, we believe, that a definite relationship exists, not between certain types of chronic arthritis and infection, as believed by many investigators, but between all types of the disease and infection. In the early case when joint destruction has not yet occurred, the prognosis is favorable, provided all foci are removed. In the advanced case, all that can be hoped for is to arrest the progress of the disease. The close co-operation between the physician and the dentist is required to obtain satisfactory results in patients with chronic arthritis.

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Discussion

Theodore B. Beust, Louisville, Kentucky: I would like to ask Dr. Meisser whether bacteriologists are agreed as to the idiosyncrasies of arthritis, and whether it is looked upon by bacteriologists in general as an infectious disease. Then does not the injection of almost any kind of a disease germ into the animals produce arthritis?

John G. Meisser: Investigators do not all agree as to the etiology of chronic arthritis. Billings, Rosenow, Nathan and others believe that the disease is of infectious origin. Certain other investigators believe that infection plays a part only in certain types of the disease, because many patients do not recover following removal of foci of infection. In this study we have grouped and classified our patients to determine just what relationship existed between infection and the various types of the disease and what might be expected in the way of recovery following removal of foci. Our results and conclusions have just been stated.

The injection of almost any kind of bacteria found in the mouth will not cause arthritis. In many of our cases, certain animals were injected with streptococci from the infected teeth, and others with bacteria recovered from the mucous membrane of the mouth. Those injected with streptococci from the infected teeth often developed arthritis, as demonstrated in the tables, while others did not. In many patients, several teeth were removed (teeth that were devitalized or treated at different times by different men), and it was found that very often they harbored the same type of bacteria with the same elective affinity for certain tissues in animals.

Either some of these teeth have become secondarily infected with bacteria from other infected teeth in the same mouth, or the green-producing streptococcus, so often found in pure culture, overgrows others that may have been introduced at the time of operation. It is also possible that many organisms which may have been introduced at the time of operation would not grow and multiply under the anaerobic conditions often found at the apices of teeth.

Weston A. Price, Cleveland, Ohio: Which, in your judgment, is the more important in establishing that condition of anaphylaxis, bacteria or the host?

John G. Meisser: It is probably the host.

Weston A. Price: I think that there is no question but that it is the host.

A. B. Crane, Washington, D. C.: In regard to this question of secondary infection, where a number of teeth in the mouth had previously been treated, what benefit would the patient derive from the elimination of those teeth if the whole system were so infected as to affect all of the teeth in the mouth?

John G. Meisser: The benefit that a patient would derive by removal of certain infected teeth would depend upon how far the disease had advanced.

A. B. Crane: If the infection has already been carried through the system from some other focus to such an extent that it attacks secondarily eight or ten teeth in the mouth, of what benefit is it to extract those teeth if the primary focus is existent in another part of the body?

John G. Meisser: If eight or ten teeth have become secondarily infected with bacteria which have the power of producing arthritis, they should by all means be removed. Primary foci also should be removed if possible. Secondary foci like those referred to are as important to remove as primary foci.

A. B. Crane: If the primary infection is in the tooth and the secondary infection is in the finger, you would not cut off the finger, would you?

John G. Meisser: I certainly would not, but I would remove the infected teeth. The repairing power of an infected joint is far greater than that of a tooth that has been rendered pulpless. The joint, even though infected, has its blood and nerve supply, and if ankylosis or joint destruction have not yet taken place, the prognosis is very favorable, provided foci of infection are removed. The pulpless tooth, however, has had most of its blood and nerve supply destroyed, and if once infected, nature cannot make a healthy tooth of it.

A. B. Crane: The proposition of a joint which has undergone atronatism some time prior to the arthritis in my opinion would be quite similar to a pulpless tooth which had been previously tested and has never shown any evidence of disease.

My contention was that if we had a system in which bacteria are wandering around to such a degree that eight teeth which were previously healthy became suddenly secondarily infected, very little is accomplished for the patient by extracting these teeth. For purely local reasons those teeth should be extracted, but in so far as contributing to the stopping of the arthritis, it seems to me you are working from the wrong end when you blame it on those teeth. The primary focus which is the source of infection is the point at which the attack on a disease should be made. I believe it would be just as sane to advocate the amputation of an infected finger as it is to advocate the extraction of a secondary infected tooth.

John G. Meisser: Teeth that are healthy do not become secondarily infected unless the pulp has been injured or the teeth have been rendered pulpless. The importance of removing infected teeth which harbor bacteria with an elective affinity for joint structures cannot be over emphasized, whether they be primary or secondary foci. We have obtained some wonderful results in patients with chronic arthritis by the removal of infected teeth and other foci. The type of patient in whom the prognosis is most favorable has been discussed in our paper. Factors other than infection may play a part in chronic arthritis but we believe that the removal of foci (even though some may be secondary) is one of the most important factors in the treatment of this disease.

INNERVATION OF THE ORAL CAVITY AND CONTIGUOUS PARTS

By J. H. PROTHERO, D.D.S., Chicago, Illinois

(Read before the Chicago Dental Society, February, 20, 1923)

IN MINOR oral surgical procedures anesthetizing the peripheral nerves close to the seat of operation is usually sufficient to obstruct pain. This is known as infiltration anesthesia. It is a general rule in surgical procedures to make as few injections as possible to accomplish the desired result, and in no case inject in an infected area because of danger of spreading infection.

For this reason, particularly in extensive operations, it is frequently desirable to anesthetize the main nerve trunk supplying the area involved at a considerable distance from the seat of operation, thus lessening the danger of spreading infection and at the same time inducing more profound and prolonged anesthesia. This method is known as conduction anesthesia, or nerve blocking, and may be accomplished by either intraoral or extraoral injection.

An intimate knowledge of the general anatomy, nerve, and blood supply of the parts injected and operated upon is therefore of the utmost importance to accomplish safely the desired results. It is not necessary in a symposium of this character to enter into minute detail as to the origin, distribution and anastomoses of all of the nerves involved in oral surgical procedures, therefore but two nerve trunks and some of their principal branches will be considered.

The fifth cranial, or trifacial nerve, particularly the second and third divisions, supply practically all of the oral tissues usually involved in dental operations. The second division or maxillary nerve leaves the Gasserian ganglion and passes out of the cranium through the foramen rotundum to the sphenomaxillary fossa where it takes the name of infraorbital nerve. Its branches are the zygomatic which supplies the cutaneous structures in the temporal region, the side of the forehead and the cheek, and the posterior, middle and anterior superior dental branches.

In the sphenomaxillary fissure the infraorbital nerve also gives off the posterior superior dental branch, which passes downward and enters the maxillary tuberosity, and continuing forward into the body of the maxilla, within its facial wall. The middle and anteriosuperior dental branches are given off within the infraorbital canal, pass downward into the maxilla and with the posterior branch which enters the tuberosity form an anastamotic loop which supplies the cuspid, bicuspid and molar teeth, the alveolar process, the periodontal membranes and periosteum of the alveoli, the gum tissue and the mucous membrane and bone of the floor of the sinus.

After emerging from the infraorbital foramen, the nerve divides, usually, into three branches, the palpebral, nasal and labial. These run downward, forward and inward, forming a thick plexus which supplies the oral mucous membrane, floor of the nose, the spongy process and frequently the anterior teeth.

The sphenopalatine ganglion is deeply

located within the pterygomaxillary fossa just below the maxillary nerve from which it receives two sensory roots. From the facial nerve it receives a motor root, the large superficial petrosal and from the carotid plexus, a sympathetic root, the deep petrosal nerve. As they pass forward they join to form the vidian nerve which enters the ganglion.

The sphenopalatine ganglion gives off sensory nasal branches to the nasal cavity, one branch, the nasopalatine passing forward in the nose to the anterior palatine foramen through which it enters the mouth and supplies filaments to the anterior hard palate.

The middle palatine nerve passes through the accessory palatine foramen and supplies the soft palate, uvula and tonsils.

The anterior palatine nerve passes through the palatine canal to the palatine foramen; from there it passes forward and innervates the mucous membrane of the hard palate to the cuspid teeth.

The third division of the fifth nerve, the mandibular, passes out of the cranium through the foramen ovale. It divides into two branches: an anterior, or motor root, and a posterior, or a sensory root. The anterior part supplies motor filaments to the muscles of mastication, and is therefore called the masticatory nerve. It gives off a masseteric branch which passes in front of the mandibular articulation, to which it gives off a filament, continues on behind the tendon of the temporal muscle, across the sigmoid notch, and is distributed to the deep surface of the masseter muscle.

The internal pterygoid branch passes downward and inward and is distributed to the deep surface of the internal pterygoid muscle. The deep temporal branch passes outward, above the external pterygoid muscle, and supplies the deep portion of the temporal muscle.

The external pterygoid branch is usually given off from the anterior division proper. It is distributed to the external pterygoid muscle.

The buccinator branch or long buccal nerve is almost entirely sensory. It passes between the two heads of the external pterygoid muscle forward to the coronoid process, downward a short distance along the anterior margin of the ramus to the buccinator muscle, where it divides at the level of Stenson's duct into a superior and inferior branch. The superior branch supplies the upper portion of the buccinator muscle and integument overlying it. The inferior branch passes downward and forward, supplying the lower part of the muscle, the mucous lining of the cheek, as far forward as the angle of the mouth, and the buccal gum from about the first bicuspid to the ascending ramus.

The posterior or sensory branch of the mandibular nerve is essentially sensory. It divides into three branches: The auriculo-temporal, lingual and inferior alveolar.

The auriculo-temporal arises by two roots between which the middle meningial artery passes. It passes backward beneath the external pterygoid muscle to the inner side of the neck of the condyle, passes upward with the temporal artery above the zygomo, where it divides into two branches, the anterior and posterior temporal. They supply the skin of the anterior part of the auricle of the temporal region of the cheek, the external auditory meatus, and part of the outer surface of the tympanic membrane. Filaments of communication extend to the otic ganglion and the seventh nerve. Parotid branches are also derived from this nerve.

The lingual nerve passes behind the internal pterygoid muscle, accompanying the inferior alveolar nerve. It then turns forward and passes down between the internal pterygoid muscle and the mandibular ramus, and crosses the submaxillary duct. It supplies the tonsils, lingual gum and periosteum, the papillae, and mucous membrane of the tongue,

and anastamoses at the tip of the tongue with the hypoglossal nerve.

The inferior alveolar nerve passes downward with the lingual nerve beneath the external pterygoid muscle between the internal lateral ligament and ramus to the pterygomandibular space. It is accompanied by the inferior alveolar artery, and both enter the mandibular foramen. Before entering the canal the mylohyoid nerve, which passes forward along the mylohyoid groove, is given off. The latter is essentially a motor nerve and innervates the mylohyoid, digastric, tensor tympani and tensor palati muscles.

Passing forward, the inferior alveolar nerve traverses the mandibular canal, a portion making its exit at the mental foramen, the remaining portion passing forward within the mandible, and supplying the cuspid and incisor teeth. Within the mandibular canal it gives off filaments which innervate the pulps and periodontal membranes of the molar and bicuspid teeth.

The gums and alveolar process are supplied by the inferior gingival rami. Passing outward from the mental foramen, the inferior dental nerve subdivides into filaments which supply the skin of the chin, the angle of the mouth, the mucous membrane of the lower lip and the anterior part of the gum as far back as the bicuspid teeth.

Quain summarizes the distribution of the second and third divisions of the fifth nerve as follows:

"The maxillary nerve with Meckle's ganglion supplies the integument of the cheek and fore part of the temple, the lower eyelid, the side of the nose, the upper lip, the upper teeth, the lining membrane of the nose, the mucous membrane of the upper part of the pharynx, of the antrum of Highmore and of the posterior ethmoidal cells, the soft palate, tonsil, and uvula, and the glandular and mucous structures of the root of the mouth.

"Cutaneous filaments of the mandibular nerve ramify on the side of the head and the external ear, in the external auditory canal, the lower lip and the lower part of the face; sensory branches are supplied by it to the greater part of the tongue, and branches are furnished to the mucous membrane of the mouth, the lower teeth and gums, the salivary glands, the articulation of the lower jaw, the dura mater and skull, and the mucous lining of the mastoid cells."

In presenting this brief outline of the distribution of the maxillary and mandibular nerves, free license has been taken with the works of Quain, Gray, Fischer, Thoma, Smith and others, all of whom should be carefully studied by those who undertake major or minor oral surgical operations.

LOCAL ANESTHESIA

By LOUIS SCHULTZ, M.D., D.D.S., Chicago, Illinois

(Read before the Chicago Dental Society, February, 20, 1923)

AS A preface to my part of the subject, I venture to add some things to what Dr. Prothero has said with reference to the nerve supply of the upper jaw—the second division. I wonder if many of you realize that in the entire upper jaw there are only six teeth which have a direct nerve supply on the labial or buccal surface, namely, the laterals and second and third molars. The other teeth have a mixed nerve supply, due to the fact that the

three superior alveolar nerves form a plexus which innervates these parts so that one cannot anesthetize any one branch and get ideal results unless one has to contend with a possible anastomosis from the other side. The cuspids receive filaments from the middle superior alveolar nerves. The bicuspids have a mixed nerve supply, and so have the first molars. The posterior middle and anterior branches furnish all the nerve supply that goes to the teeth, jaws, and buccal or labial gums, and the nasopalatine and anterior palatine nerves are engaged in supplying the soft tissues of the hard palate only. It is important to bear this in mind in considering local anesthesia.

So far as technic is concerned, there are three methods which may be used successfully and rationally in order to bring about ideal conditions for operations in general dental practice, namely, the intraosseous, infiltration and conductive methods. The first and the least valuable or the intraosseous method is indicated in cases of pulp extirpation and cavity preparation, and there only in cases where infiltration anesthesia does not succeed. In most of the teeth in the upper jaw one injection on the labial or buccal surface is sufficient, when done right, to get complete anesthesia for pulp extirpation and cavity preparation.

There is no advantage in the intraosseous method if the infiltration method is successful.

In the lower jaw, the same principle applies, except that in the molar region the conductive method should be used.

Technic of intraosseous anesthesia. A short needle and a drill are needed. Any kind of a drill will do so long as its size corresponds closely to that of the needle. The drill should be a trifle larger than the needle so that the needle does not bind. A few drops of the solution are injected at the selected point of entrance, which should be that part of the process which shows the greatest width of cancellous bone between the tooth to be anesthetized and its neighbor. The needle is inserted in the interspace anywhere between the apex and a little rootwise of the gingiva. The injection is made under the periosteum, the needle is withdrawn, and before using the drill, the gums or soft tissues are stretched with the thumb or finger at the place where the injection was made, and are held taut with the finger. One or two revolutions of the drill in the engine inserted through the needle puncture to the bone carries it through the plate into the spongiosum as evidenced by a loss of resistance to the drill. Keeping the gum taut with the finger, the needle is reinserted and it enters easily into the opening made by the drill. The procain solution should not be stronger than 1 per cent when making an intraosseous injection. Also the adrenalin should not exceed a strength of 1 in 100,000. The anesthesia is instantaneous. One injection will answer for two or three adjacent teeth. Five or six drops is enough for one tooth. Eight or nine drops is more than plenty for two or three teeth, on an average. Usually these operations can be performed by using the infiltration method over the labial or buccal aspect of the upper teeth, and anesthesia of the anterior lower teeth can usually be obtained by this same method. Lower bicuspids and molars are not usually amenable to the infiltration method, the external plate in that region being devoid of the foramina. Occasionally one may be successful by injecting the solution at the cervix, or the gingival border, in cases in which foramina transmit the solution to the spongiosum.

The second and more valuable method of producing local anesthesia is mucous anesthesia or anesthesia by infiltration. This method should not be hard to master. It consists in the insertion of a sharp needle under the periosteum in the neighborhood of the apex of the

tooth or teeth which are to be anesthetized, inserting the needle in the interspace between it and the tooth in front of it, midway between the gingiva and apex. Passing the needle diagonally toward the tooth apex, the solution is slowly deposited under the periosteum over the tooth. The injection properly made does not raise a wheal; at most a small diffuse swelling results, the periosteum confining and forcing the solution into the bone. One injection over any tooth on the buccal or labial surface suffices and one injection on the lingual surface parallel to the long axis of the lingual root will produce satisfactory anesthesia for the extraction of that particular tooth. One injection on the labial or buccal surface will produce satisfactory anesthesia for pulp extirpation or cavity preparation. In order to be successful, the needle must be locked under the periosteum, the beveled end toward the bone; the solution must be injected slowly and at body temperature. This will produce absolute anesthesia in practically all upper teeth, and in the six lower anterior teeth.

The most important type of anesthesia with which we are acquainted today is conductive anesthesia, produced by making an injection at a point quite distant from the area where we wish to operate. It arrests at the point of injection all pain impulses in the nerve trunk as they pass from the periphery to the brain. It is the method which gives the greatest amount of satisfaction to the operator and affords the patient the greatest amount of comfort.

Conductive anesthesia is not hard to practice. Anyone familiar with the anatomy can successfully produce anesthesia by this method.

To anesthetize the region of the upper incisors, one can make an injection near the anterosuperior alveolar branch as it comes down in its special canal from the infraorbital nerve. The needle is inserted in the reflection of the mucosa from the gums to the lip near the cuspid tooth, advanced in the direction of the ala of the nose, the needle point with beveled end toward bone locked under the periosteum and about 1 cc. of 1 per cent solution discharged. A few drops placed mesially to the central incisor takes care of any anastomosing branches from the other side. Lingually the injection is placed near the incisive foramen, not into it but near it, catching the nasopalatine nerve as it comes down to innervate this area. The territory of the cuspids, bicuspids, and first molar may be considered together. The injection just mentioned is made, then the middle superior alveolar branch is dealt with as it comes down also in a special canal from the infraorbital nerve to supply the bicuspids. The needle is inserted in the bicuspid region in the reflection of the mucosa from the gum to the cheek, placed under the periosteum as described above and a 1 per cent solution of procain injected.

Anesthetizing the posterosuperior alveolar branches supplying the molars. With the patient's lips relaxed and jaws almost closed, the lips are retracted with a mouth mirror. The needle is inserted at a point opposite the upper second molar at the reflection of the mucosa from the gun to the cheek and a little away from the gum, so that it is in loose soft tissue where it can be manipulated easily. The needle should be directed upward, backward and inward, advanced just under the gum when the injection is begun; at a depth of about one centimeter, the posterior surface of the maxilla should be felt. If so, the same direction is maintained until the needle is at a depth of about two centimeters, when from one to two cc. of the solution are deposited. The posterosuperior alveolar branches as they come from the infraorbital fissure pass outside of the periosteum, hence the needle is not passed under that structure. On the lingual the injection is made near the

incisive foramen for the nasopalatine branch and into the posterior or greater palatine foramen for the anterior palatine branch. Injection into the latter foramen should not exceed five or six drops of the solution. The amount is limited in order to obviate anesthetizing the soft palate and tonsils, thereby causing gagging, nausea, and retching.

Some of these injections may be combined. The anterior and middle superior alveolar branches may be reached by an injection into the infraorbital canal. It is an easy matter to find the infraorbital foramen by palpating it with the index finger. Keeping the finger on the foramen, the needle is inserted at the reflection of the mucosa from the gum to the lip, in the direction of that foramen under the finger, and guided home as it is felt under the finger. An injection of two or three drops of the solution is made at the first approach to the foramen, after which the needle is guided into it. With the needle opening pointing posteriorly, the solution is slowly injected under firm pressure on the foramen by the finger. Two cc. of 1 per cent solution of procain suffices to produce perfect anesthesia of these two branches. I think it unnecessary for any one to use a stronger solution than 1 per cent of either procain or novocain in general dental practice.

Conductive anesthesia relating to the mandible is much more simple than that of the maxilla. In making a mandibular injection the course and relations of the lingual and inferior alveolar nerves should be remembered. These structures can be approached in a straight line and the needle need never be passed beyond the mandibular sulcus.

The technic consists in first palpating the retromolar fossa. The index finger is placed into this fossa, hugging the internal oblique line with the finger nail. The needle is inserted at a point one centimeter above the occlusal plane of the molar teeth, and just medially to the finger nail. Or the concavity on the anterior border of the ramus is palpated, the index finger placed in it, hugging the internal oblique line, and the needle entered at a point just medial to the finger nail and at its center holding the syringe like a pen, and approaching from the bicuspid region of the opposite side, allowing its barrel to rest on the bicuspids. A few drops are injected as soon as the mucosa has been punctured, then the needle is advanced from half to three-quarters of an inch in the same direction. At that depth it should strike the posterior wall of the mandibular sulcus and the patient will flinch. It is painful. The injection is begun while the needle is there, then the needle is passed back and forth so that the solution may be distributed over the greatest area and emptying the solution into a vessel is avoided. If the needle should strike the periosteum again the parts are anesthetized. That is the advantage of beginning the injection while the needle point rests against the bone the first time.

Dr. Prothero intimated that I would have something to say with reference to the long buccinator nerve. This is purely an anatomical point concerning which I differ with some authorities. I take the position that the long buccinator or buccal nerve has never yet been reached by any operator in making a mandibular injection if he makes the injection according to the technic I have just given.

There are from ten to fifteen per cent of cases in which the buccinator nerve comes into question, and in those cases that nerve helps to innervate the buccal mucosa along the molars and bicuspids. In the other cases the buccinator nerve does not reach that territory.

What about the ten or fifteen per cent of cases in which the buccinator nerve is involved? When the operation on the lingual is begun, the patient soon realizes that there is no pain; then the buccal field may be attacked. If the patient should

feel pain, and there is no infection in that area, infiltration anesthesia will control it at once. If there is infection, the needle is inserted five millimeters below Steno's duct, advanced directly backward, aiming for the anterior border of the ramus, injecting all the while it is advanced and withdrawn, and the buccal nerve is anesthetized at once.

The mental foramen injection. That foramen lies in the region of the bicuspids, usually between the two. It can easily be palpated. The injection should be made when standing behind the patient, pointing the syringe downward, forward and inward. The canal, extending through the mental foramen, curves on itself, so that its direction is upward, backward and outward, making it necessary to go in the opposite direction if the point in the canal is to be reached where the incisal branches are given off.

By making a mental injection on both sides, also taking care of the inferior alveolar and lingual branches distal to the field of operation, the anterior portion of the mandible is completely anesthetized without involving the molar regions.

In conclusion, a word about suprarenin or adrenalin. Untoward effects are usually produced, not by the procain, but by the adrenalin or suprarenin, and by the suprarenin more than by the adrenalin. There is a difference between the two. The danger is greater from synthetic preparation than from that obtained from the suprarenal gland, the literature to the contrary notwithstanding.

When the adrenalin or organic product becomes partly oxidized, shown by discoloration, it has lost some of its efficiency, but its toxicity has not increased. When the synthetic preparation becomes yellow or brownish, it should be discarded, because it becomes intensely more toxic than it was originally. Furthermore, the size of the dose of adrenalin or suprarenin makes it as a powerful toxic drug. For that reason I advise the smallest possible dose for the case in hand.

Discussion

P. G. Puterbaugh, Chicago, Illinois: The anatomy as reviewed may have seemed to be a large dose, but you must always bear in mind the anatomy of the parts when employing local anesthesia. There is nothing that will do so much for better dentistry as painless operating. Let us not limit this method of anesthesia to surgical procedures alone, but let us use it in the removal of pulps, in the anesthetization of hypersensitive dentin, and in fact employ it to guard against pain while operating and thereby enable us to do the best type of dentistry. It is true that we can all do better work when employing local anesthesia. Anyone can do better cavity preparation if he does it painlessly. The judicious use of conductive anesthesia will do more to promote better dentistry than any other one thing because this method of anesthesia is practical and is perfect in its results.

Some eight or ten years ago we were all swept away with analgesia, but we soon got back on our feet again. Conductive anesthesia did not come as a wave but gradually and surely, and it is here to stay.

Mention has been made that needles have broken in tissues; and not all of these breakages have occurred in the hands of novices. I would emphasize the fact that these needles have invariably been inserted beyond the depth to which they should have been placed. The maximum depth to which a needle needs to be inserted for any mandibular injection is three-quarters of an inch. That has been pointed out, but as a matter of fact, half an inch will reach 95 per cent of them. In order to avoid inserting the needle too deeply, use an extension hub on the syringe or a syringe that is long enough so that you do not get your hand over the patient's mouth and obstruct the view of the needle. Always keep your eye on the needle from the time it enters the tissue until it is withdrawn, and that will enable you to avoid breakages.

Another point which Dr. Schultz brought out and I desire to emphasize it, do not change the course of the needle after it once starts through tissue; do not attempt to change the direction of the needle, because in this way you encourage needle breakage. Start the needle in a straight line for the point you aim to end in, carry it straight in, make the

injection, and bring it straight out in the same line, and you will not break needles.

As to the material of which needles are composed, I find nickel needles entirely satisfactory. Nickel needles do not rust, and I am afraid some of the breakages of steel needles have been caused by rust within the lumen of the needle. In conductive anesthesia the puncture is made at a point distant from the gingival margin, and as you get away from the gum margin you get into tissue that is less sensitive to puncture. The injection is made at a point where the tissues are held loosely together, and that makes it easier for the solution to diffuse through the area.

Emphasis has been placed upon the injection of the lingual nerve. Many operators forget that the lingual nerve supplies the mucous membrane on the lingual side of the lower incisor teeth, cuspids and bicuspids; that in order to get anesthesia of this lingual surface it is necessary to anesthetize the lingual nerve at the same time the mandibular nerve is injected.

As to the anesthetic solution, we can well afford to take time to follow the methods outlined by Dr. Clark. While there is a temptation to employ ready-prepared solutions, you would be surprised if you knew the formulae of some of the solutions advertised for sale; some of them are not isotonic at all. The drugs that are used to preserve them are certainly irritating to the tissues. Why not use a fresh and clean solution rather than one with a preservative that will irritate at the point where the injection is made. I would say this: If you are going to use ready-made solutions of doubtful formulae you had better not use them for nerve blocking lest you get permanent anesthesia. If you anesthetize the terminal endings of the sensory nerves, it matters little if permanent anesthesia does occur, but if you anesthetize the whole side of the face and it stays that way, your chickens will come home to roost.

The use of procain, in spite of all substitutes offered to date, stands at the top. We have had in the last few years many rivals of procain, but none of them have been as satisfactory.

Frederick F. Molt, Chicago, Illinois: One of the principal things I would accentuate in such a symposium as this on block anesthesia is that in teaching the tendency seems to be to add too much in the way of extraneous anatomic information, which is more or less confusing to the men you are trying to teach. In other words, if we are trying to teach men to block a certain area in the mouth, it confuses the mind of the listener regarding any certain nerve you are blocking to go into too great detail as to the origin of the nerve and the area supplied by it, as the tip of the nose, or the forehead or the mastoid or what not areas we are not interested in working upon. The simplest way of teaching block anesthesia according to my observation is to help the man who is trying to get the information to visualize the exact area he is trying to anesthetize and to learn that by making the injection at a definite point (knowing, of course, the anatomy of that area so that he will not go far astray) he will obtain the desired anesthesia.

It seems to me we have never had anything in the way of teaching facilities better than the anatomic specimen of Arthur E. Smith's which have been shown to us from time to time to help us to visualize these areas, and the method of reaching the point where we wish to make the injection. In addition to that, in these wet specimen we always have profound anesthesia, which is a distinct advantage.

Dr. Prothero's summing up of the anatomy was excellent, and it would be well for the student to go into this, work it out, and then by eliminating some of the extraneous material, know exactly what we need for oral anesthesia. That has appealed to me as being very essential in teaching. On the other hand, we cannot help but admit the truth of the old adage that "a little knowledge is a dangerous thing," because we have seen so many unfortunate results from the attempts of some men who with only a superficial knowledge have attempted to accomplish block anesthesia.

We have been told by Dr. Schultz and Dr. Puterbaugh that this method of anesthesia is simple. It is if you go about it in the right way; it becomes a more or less mechanical procedure, and yet it cannot become so mechanical that we need not use exactness in technic and give consideration to deviations in anatomy which we encounter in various cases.

Dr. Schultz mentioned that there is no fixed measurement we can adopt in making these injections, which is all too true. The measurements that we are given are average measurements, and we must adapt them to the anatomic deviations we find.

He is also quite right in saying that we must take no chances with the needle; must not try to make it go around corners and expect to accomplish results. Whether we use the Fisher technic, as elaborated by Smith, or the Hancock technic, where one uses a curved needle, there is a procedure which must be adhered to in order to accomplish results.

There is one point I think we might dwell on profitably, and that is the matter of hema-

toma. In teaching this subject I have frequently been questioned by men who have undertaken this work and have been discouraged because of having that rather unfortunate accident of hematoma. This is not serious, and we may well go into this production of hematoma. The operator perhaps nicks a small blood vessel in inserting the needle and produces an immediate swelling of the tissues over the point where the injection is being made. This swelling may eventually turn blue or become discolored as a bruise would. A thing of that kind would probably alarm the patient, and if the operator were not familiar with it it would alarm him, but it is unavoidable if one is doing a great deal of this work, particularly if making injections in the region of the maxillary tuberosity, but while we would like always to avoid it, it should not be disturbing because it is bound to happen occasionally.

Dr. Puterbaugh's point that the needle should be *long enough* is very well taken; it should be more than long enough, and we will not, then, if we are following an exact technic, have the unfortunate experience of breaking the needle completely off in the tissues. Needles almost invariably break at the hub, and if there is a portion of the needle outside of the tissues, there will be no difficulty in removing such a needle.

The first requirement in the preparation of the solution is perfect asepsis, and if there is anything that should be accentuated it is that. I cannot see how some who presumably are conscientious operators and clever surgeons can reconcile with this their procedure of using tap water and tablets that are not sterile, and expect to accomplish perfect anesthesia with no ill effects under such circumstances. It is as unfortunate that perfect asepsis is not always carried through in this work. A fresh solution is infinitely more desirable than a stock solution that is of doubtful age and doubtful sterility.

Dr. Prothero, (Closing): Mention has been made of the use of anesthesia in cavity preparation. It is true cavity preparation can be painlessly accomplished by this means. It is also true that hyperemia and death of pulps are of frequent occurrence under fillings placed in cavities so prepared.

Benumbed by the anesthetic a pulp can give no warning of the near approach of the instrument and the operator in his anxiety to develop ideal resistance and retention form is apt to excavate too deeply. A number of cases of pulp death due to thermal shock have recently come to my attention. All of these followed shortly after cavity preparation under anesthesia. The lower anterior teeth and the upper laterals, because of their small size, are the ones most liable to injury from cavity preparation under anesthesia.

The relation of the various anatomic structures to each other is of great importance. Lack of knowledge of such relationship is liable to result in grave complications. One such instance, observed not long since, occurred in blocking the mandibular nerve. In this case unilateral paralysis of the face was induced, the muscles of expression remaining inactive for nearly two months. The needle in this case was passed entirely through the pterygomandibular space, into the parotid gland until the facial nerve which passes through this structure was reached and anesthetized.

Dr. Schultz, (Closing): With regard to the use of nickel needles, Dr. Puterbaugh is right. There is no reason why one should not use nickel needles or steel needles as long as they give satisfaction. I am using steel needles because surgeons throughout this country and other countries are using them unless there is some special indication for another type of needle. When steel needles get dull you can sharpen them with new ones. Nickel needles have the advantage that they do not rust but neither will steel needles rust if cared for properly and renewed often enough.

Dr. Molt spoke of the difference between a one and two per cent solution. I want to emphasize that in all my work on the jaws, including major work, I do not use a solution stronger than one per cent. I find a one per cent solution sufficiently active for my work. I remember the time when I used a 2 per cent novocain and a 1 in 20,000 solution of suprarenin or adrenalin along with it, but I use weaker solutions now and get just as profound anesthesia without unpleasant reactions.

BETTER NUTRITION OF CHILDREN

By LYDIA J. ROBERTS, S.M., Chicago, Illinois

(Read before the Illinois State Dental Society, Decatur, Illinois, May 8-10, 1923)

IT IS a gratifying evidence of progress when a nutrition person addressing a group of dentists feels no necessity for presenting arguments to show that nutrition has a logical part in a campaign for better teeth. A few years ago these would have constituted the major part, if not the whole, of his discourse. Fortunately, we can today take it for granted that all progressive dentists are—indeed must be—interested in nutrition, and not solely in tooth nutrition, but in the general nutrition of the whole body. This is true of the entire group of specialists. No matter how concentrated may be the interest of each—the heart and lung specialist, the gastro-internist, the skin specialist, the educator, the physical training specialist, the dentist—no one of them can select his one part of the body and say, "This is my field, I care nothing for the rest," and expect to be in a high degree successful in his work. Each one knows that the health of one part of the body is dependent upon the health of the whole, and particularly upon its nutrition. To disregard this fundamental fact courts failure even in the special line. To illustrate:

In my early days of teaching, I became interested in a little girl in my room who belonged to a large poverty stricken family, and decided to take her for my private charity. I bought her a complete outfit of clothing, shoes, rubbers, coat, mittens, changes of underwear and stockings, two dresses, and several aprons so she might always be clean. For a short time I was gratified by the sight of the clean, comfortably dressed child. It was not long, however, before I found that instead of having the changes I had planned, she was wearing the same underwear, stockings, dress, and apron which were daily becoming dirtier and dirtier. On inquiry I found that the mother—who unlike me was interested in all her children, not merely one—had given one suit of underwear to a brother, the rubbers to another whose shoes were not good, and had parceled out the stockings, aprons, and dresses as best as she was able among the children. Thus what I had selfishly planned would be enough to keep one child well dressed, had been divided as best it could be in the interests of the whole family. I learned my lesson—the only way I could improve the condition of my particular child was to look after the welfare of the entire family. It is this same lesson which specialists have learned about the human body. However little they may actually care about the child as a whole, they must be interested in his general nutrition and well-being, in order to succeed in their chosen fields.

It is with this fact in mind that I have chosen to speak on the general subject of nutrition of children, rather than on some special relation of diet to teeth, knowing that you realize its fundamental importance and can make your own application.

The Need for Better Nutrition

The title of this paper carries in it the implication that the nutrition of

children in general needs improving. I know of no better way to convince a person of the truth of this suggestion than to build up in his mind by description and observation a well-defined picture of a thoroughly well-nourished child, and then to send him out in any neighborhood he chooses, to see how many children he can find who measure up to his ideal. He will invariably come back and tell you that it is like looking for the proverbial needle in the haymow. He finds some who are fairly good, and many who are distinctly below par, but few indeed who meet the requirements of his standard. Or better still, take a group of 100, 1,000 or more children and sort them into nutrition groups as a farmer might sort out his corn into piles, putting into one pile, let us say, only the perfect ears which he can use for seed corn; into another the ears which fall just short of this; into a third the ears which are only fair, but still usable; and into the fourth the "nubbins." Any good farmer can easily do this because he has in his mind an exact idea of what constitutes a perfect ear of corn. In the same way a person who has trained himself to be a connoisseur of children can group them into similar nutrition groups.

Many of such studies have indeed been made among all classes of children. I shall give the results of two which are more or less representative of the others.

In March, 1918, the Bureau of Child Hygiene of New York City studied all the school children in the borough of Manhattan[1]. The following results were secured when 17,661 children were examined and classified:

Grade I (good) 17.3 per cent; Grade II (fair) 61.1 per cent; Grades III and IV (poor) 21.6 per cent.

In other words, only seventeen out of every hundred children measured up to the standard of normal nutrition, while twenty-two out of every hundred belonged to the poor nutrition group, the remaining falling short in varying degrees from the standard of normality.

In a nutrition survey made by the United States Children's Bureau in a rural county in Kentucky even poorer conditions were found.[2] Out of every hundred children examined in this locality only seven fell into the excellent group, comparable to the farmer's perfect ears of seed corn, eighteen into the group just short of this, thirty-five into the fair group, and forty—almost half—into the poor nutrition group, which is typified by the farmer's nubbins, resulting as follows:

Grade I (excellent) 7 per cent; Grade II (good) 18 per cent; Grade III (fair) 35 per cent; Grade IV (poor) 40 per cent.

To many people the forty children in the poorest group constitute the sole cause for anxiety. Much of the present-day nutrition propaganda, indeed, calls attention merely to this much below par group. Without in the least decrying the attention given to these, I may still say that to many of us the extremely small number in the excellent group is, if anything, even a more striking revelation of the need for improved nutrition of children. Not all localities or classes of children it is true, would assay quite like these, but it is doubtful if one could find a community in which the distribution per one hundred children would be better than twenty-five in the top group, and not over twenty-five in the lowest one. Such being the case, fully three-fourths of all our children are in need of nutritional care, and one-fourth to one-third of them in urgent need of it. When we bear in mind the fact that the majority of children are born into the world healthy, and that given this start they should, with proper surroundings and nurture, develop into healthy, well-nour-

[1]Weekly Bulletin Department of Health, City of New York, 6, 1918, p. 75.

[2]"The Nutrition and Care of Children in a Mountain County of Kentucky." United States Department of Labor, Children's Bureau. Publication 110.

ished children, it is evident that conditions of care and nurture may well be challenged.

Nor is it difficult to discover what is responsible for the situation. Even a casual inquiry or observation in any individual case will usually reveal causes in plenty for the condition. It is, in fact, almost as difficult to find a child living on a suitable, adequate diet as it is to find one physically superior. In the Kentucky section, for example, only four out of every hundred children were living on diets that were capable of producing and maintaining good nutrition, twenty-four on diets which were a little short of this, forty-five on highly questionable ones, and twenty-seven on diets which were extremely poor and inadequate.

In a similar study of 6,000 pre-school children in Gary, Indiana, the diets were even less satisfactory.[3] In this locality only nine out of each hundred children had diets meeting all the requirements of good nutrition, while sixty out of every hundred—nearly two-thirds—were plainly not having all their bodies needed for normal, healthy growth.

Judged by either standard then, the condition of the children themselves, or by the diets on which they are living, there is ample evidence that the present nutrition movement is founded on a real need. Before we consider what are the chief factors at fault, and how to remedy them, it is well to have in mind the requirements of adequate nutrition in childhood, and how it may best be assured.

Requirements of Good Nutrition

A diet containing all the elements necessary for the growth and functioning of the body, together with sleep, and suitable amounts of play in the fresh air and sunshine constitute the prime essentials for normal development of a child. The food substances required to nourish the human body are probably now known with a fair degree of accuracy. These needs, moreover, are specific; and it is only by having every necessary constituent in amounts required by the body that good nutrition can be secured. What these food requirements are need be only briefly stated in this connection.

Energy

The most conspicuous need, though not for that reason necessarily the most urgent one, is for a sufficient total amount of food—not in the mere sense of bulk alone, but of sufficient calorie value—to furnish energy for all the body activities. This amount depends on the size and the age of the individual, and especially upon the amount of his activity. An active four-year-old, for example, may need 1500 calories daily, one-half that of a man at hard work; a ten-year-old probably 2200 calories or more, as much as his mother; and a fourteen-year-old close to 4000 calories or even above, all these figures varying within wide limits.

Protein

Were energy the sole need of the child's body, any food or mixtures of food chosen at random would suffice to cover it, providing enough were eaten to total his 1500, 2000, 4000 or more calories; but it is not. Every growing child needs daily liberal supplies of the materials out of which his body structure itself is built. He needs protein for the growth and repair of muscles, nerves, heart, lungs, glands, and every other living tissue of the body. This protein, moreover, must not only be sufficient in amount, but of a kind suitable for growth. A certain amount of the day's protein, therefore, should come from animal sources—from milk, eggs, meat, or fish.

Mineral Salts

In addition to protein, there are certain mineral salts which are specifically needed in the body's structure, in the skeleton, the tissues, and in the blood and other body fluids. Three of these

[3] "Children of Pre-School Age in Gary, Indiana." United States Department of Labor, Children's Bureau.

need special attention for they are not always plentiful in a diet unless care is taken to provide them: calcium and phosphorous which are essential for the formation of bones and teeth; and iron which is an important constituent of the red blood corpuscles.

Vitamins

Besides the proteins, fats, carbohydrates, and various mineral salts which are present in measurable amounts, the diet to be adequate for growth must include foods furnishing all of the vitamins—A, B, C, and D (if there is a D). It must also obviously contain water and some indigestible residue to favor normal elimination of waste.

Not only does the body require all of these substances, but the failure to have any one or all of them in optimum amounts means faulty or malnutrition, the type of malnutrition and the degree depending upon what is lacking and in what amounts. All the food substances, for example, may be present, but the total quantity, the calorie intake, may be too low for the activity expended. If the child continues his same activity, he must burn his own body to furnish the fuel, and loss of weight results. The starved horse with prominent ribs and hip bones is a familiar example of a body being thus burned as fuel, one which any person would recognize as due to too little food for the work demanded. When it happens to be a child whose body shows the same signs of having insufficient fuel, it is usually attributed to heredity or to some other cause. "What would you think," asked one of the agents in a rural survey, of a farmer whose son was of this type, "if you had a horse who looked as bad for a horse as that boy does for a boy?" "Waa'l naow!" said the farmer, looking at the boy as if he were seeing him for the first time, "I spect I'd have noticed it sooner if it'd been a horse!" And so he would, and his neighbors or the humane society would have taken steps to see that he was not allowed to keep an animal and starve or overwork him.

On the other hand, even though the diet may be sufficient in amount, it may fail to furnish the materials for body growth. A shortage of protein, of calcium, of phosphorus, or of iron, no matter how generous the total intake may be, cannot fail to result in abnormal growth of the tissues and organs of which these substances are essential parts.

A lack of any of the vitamins interferes with normal growth, and in addition the withdrawal of each vitamin individually causes a specific deficiency disease—the absence of A causing the eye disease xerophthalmia; the lack of B, a disease characterized by nerve degeneration, beri beri; the lack of C, scurvy; and the lack of D, in combination with other factors, rickets.

Extreme cases of failure in nutrition such as have been described are conspicuous and usually recognized as such. Most of the children with whom we are concerned do not fall into these classes. Their diets are not, as a rule, completely lacking in any one substance but are under the optimum in several respects. The result is not a specific deficiency disease, but rather a general failure to develop to the fullest standard of normality which may be shown in a variety of ways. Slight indications of rickets, mild anemia, poor structure of teeth, flabby muscles, unstable nervous system, and underweight are some of the common ways in which the results of such inadequate diets become manifest. The majority of these children pass as "well," or as merely "delicate" and little attention is given to them. It is this large body of so-called well children, in particular, which we wish to urge upon your attention.

How These Requirements May Be Covered

There is a great variety of food combinations which are capable of covering all these requirements, as the varying

types of diets which groups of people on various parts of the globe have found successful, testify. It makes the problem more concrete and graphic, perhaps, to express these body needs in figures in so far as we can, and then to test certain foods and combinations to determine whether they can cover these needs, and if not to learn wherein they are lacking.

The requirements of an adequate diet for an average man of 154 pounds, as arrived at by careful experimentation by Dr. Sherman of Columbia, are: Calories, 3000 plus; protein, 75 grams; calcium, .67 grams; phosphorus, 1.44 grams; iron, .015 grams; and vitamins A, B, C, and D in liberal amounts. With this standard in mind, it is interesting to inquire first: Is there any one food which alone is capable of meeting these needs?

Table I answers this query for a number of typical foods. Each food has been used in the amount necessary to furnish the required 3000 calories for the adult man, and the other constituents furnished by this amount of food computed, to determine the extent to which this food alone could furnish an adequate diet. If the contribution of protein, minerals, vitamins, of each food in the table be compared with the requirement at the top, the value of each as a sole food is readily apparent.

Sugar and lard are taken as examples of a pure carbohydrate and a pure fat respectively (1 and 2). The quantity of either to furnish 3000 calories (60 tablespoons of sugar and 30 of lard) is a perfectly possible amount as regards bulk. The difficulty lies in the fact that no matter how much of either, alone or in combination might be eaten, they could never support life, for they are fuel foods and nothing more. Butter is but little better though it has traces of minerals and is rich in vitamin A (3).

Apple has been taken to represent the fruits (4). The first objection to it as a sole food is its bulk. It would be a practical impossibility for the human stomach to hold the amount required to furnish the energy needed (thirty to sixty apples, depending on the size). And

CAN ONE FOOD ALONE MAKE AN ADEQUATE DIET?

TABLE I

	Food	Amount	Cal.	Pro.	Ca.	P.	Iron	A	B	C	Laxative
	Requirement		3000	75g.	.67	1.44	.015	+++	+++	+++	+++
1	sugar	60 tb.	3000	.....	.....	.....	.....	.....	.....	.....	.....
2	lard	2 cups	3000	.....	.....	.....	.....	.....	.....	.....	.....
3	butter	2 cups	3000	.4	.06	.06	.0009	+++	.....	.....	.....
4	apple	30 large									
		60 small	3000	19.	.36	.60	.014	.....	+	+	+
5	cabbage	60 cups	3000	15.0	4.30	2.76	.1050	++	++	++	++
6	spinach	60 cups	3000	26.	8.40	8.60	.45	++	++	++	++
7	beef	4 lbs.	3000	400.	.15	4.30	.060	—	some	some if raw	—
8	bread (w)	60 slices	3000	105.0	.33	1.05	.010	—	—	—	—
9	bread (e)	60 slices	3000	108.0	.60	2.13	.020	—	+	—	+
10	oatmeal	20 cups	3000	126.0	.51	2.90	.029	—	+	—	+
11	corn (bolted)	20 cups	3000	75.0	.15	1.60	.009	yellow +	—	—	—
	corn (entire)	20 cups	3000	90.0	.18	3.00	.024	yellow +	+	—	+
12	potatoes	30 small	3000	80.0	.48	2.00	.047	—	+	+	?
13	eggs	40 med.	3000	270.	1.35	3.70	.060	++	+	?	—
14	milk	4 qts.+	3000	143.	5.20	3.00	.010	++	++	+	—

even if it were possible, the calcium would still be less than half that set by the standard and protein and vitamin A certainly under the amount desired.

Spinach and cabbage (5 and 6) like fruits, are out of the question as the only food, because of their excessive bulk, but they are otherwise excellent foods save for their small amount of protein. Calcium, phosphorus, and iron are many times the Sherman standard and all three vitamins are present in liberal amounts. It may be readily seen from this table how herbivorous animals, whose stomachs have the capacity to contain huge quantities of food, can be perfectly nourished on their diet of grass and leaves in general; and it will likewise be remarked how valuable these leaves would be as a part of the human diet.

Compare with these, muscle meat (7), a food upon which many people insist man may easily live. With no other food in the diet, one might presumably eat four pounds of lean meat, as the table shows would be necessary to do; but even when he had done so, one would still be far below his needs for calcium and doubtless also in all the vitamins.

It is perhaps wise to state in this connection that the carnivorous diet as eaten by animals and by some races of mankind is not the muscle meat diet which is shown here. Such a carnivorous diet is quite superior to this in that it includes the blood and glandular organs, the heart, liver, and entrails, as well as some of the softer bones. These parts, which we discard, eaten by the animal, supplement this muscle meat diet exactly where it is poor—in calcium and all the vitamins—and makes it a perfectly adequate one.

Similar to meat in its deficiencies is white bread (8), as well as all the refined cereal products—white flour, spaghetti, rice, and most of the breakfast cereals. These are all valuable foods for energy and for some of the protein in the diet, but there their service practically ends, since they, too, are extremely low in calcium, phosphorus, iron, and all three vitamins and the protein is not one which can be depended on alone to support growth.

Whole wheat bread, whole cereals—as whole cornmeal, oatmeal—and potatoes (9, 10, 11, 12) are far superior to white bread and refined cereals since in addition to calories and protein they contain the phosphorus, iron, and vitamin B which are removed with the bran from the highly milled products. Even these foods, however, fall short of meeting the standard in several essentials, notably so in calcium and in protein. "Man cannot live by bread alone" is a strictly physiological fact.

Milk I have purposely left till the last. (14) "Milk is a perfect food" is a bromism heard very commonly among lay people. While this statement is more nearly true of milk than of any other single food, it is far from being the exact truth as this table shows. It contains generous amounts of the best growth proteins, of calcium, phosphorus, all of the vitamins, providing—as we are always compelled to add—the diet of the of the cow contains them. Nevertheless, milk has three shortcomings as a sole food after early infancy: (1) It is low in iron—though far from deficient in it as one commonly hears stated; (2) it is non-laxative, since it is almost completely digested; and (3) the amount required is unwisely if not impossibly large. To attempt to live entirely on milk after early infancy is never successful, though the wisdom of including it liberally in the diet of both children and adults is strikingly apparent from this table.

These few illustrations are sufficient to show that no single food is able to supply all the body's requirements. A study of these tables, however, shows plainly that it would not be a difficult matter to find two or three foods which supplement each other's deficiencies in such a way that together they would make an ideal diet. This indeed is the prob-

SIMPLE COMBINATIONS

TABLE II

Food	Amount	Cal.	Pro.	Ca.	P.	Iron	A	B	C	Laxative
milk	2 qts.+	1500	71	2.6	2.0	.005	+++	++	+	—
whole cornmeal		1000	30	.06	1.0	.008	?	++	?	+
fat	5 lbs.	500	.....	.....	.....	.....	.....	.....	.....	.....
	Total	3000	101	2.66	3.0	.013	+++	+++	- + -	+

PROBABLY BARELY ADEQUATE

lem of the dietitian—to plan food combinations which will provide for every essential constituent in liberal amounts. Some simple combinations have been worked out for illustration. The amounts of food have necessarily been dogmatically assumed. Nevertheless the diets serve to illustrate the significant facts.

Table II shows that a diet of whole cornmeal, milk, and fat may probably barely meet the Sherman standard. The milk amply covers the protein, the calcium, the phosphorus, and probably the vitamins; the cornmeal adds the iron and indigestible residue which the milk lacks; and the fat furnishes energy in a concentrated form so that the bulk of food is not excessive. It was practically this diet on which the people in the section of Kentucky, to which I have already referred, were found to be living. Milk was regarded as a necessity and whenever obtainable was drunk regularly by both children and adults "like it was water" as they expressed it. The unfortunate part was that milk was not always plentiful—the yield per cow was small due to poor food given them; there were periods when the cow was dry, and some families could not afford a cow. With the amount of milk low, or its quality poor, this diet fell far below the safety line as may be readily seen.

Though the milk, cornmeal, fat diet is doubtless barely adequate, the addition of a liberal quantity of vegetable removes all doubt, since it adds iron and all three vitamins. (Table III). A diet of these four foods, however monotonous it might be, is still a highly satisfactory one from the standpoint of adequacy—far more so, I venture to say, than the one on which most of us here are probably living. Its virtue, bear in mind, however, lies not in the small number of foods it contains, but in the ones chosen.

A diet of milk, potato, fat of the Irish peasant type, or one of oatmeal, milk and fat, more favored by the Scotch, are likewise capable of at least barely meeting the standards, though the addition of a vegetable would make these also more certainly safe as well as more palatable. (Tables IV and V).

In contrast with these simple adequate diets, take a more elaborate one, which is often referred to as the typical American diet, one consisting of muscle meat, potato, white bread, other refined cereals, and foods made of flour, sugar, and fat,

TABLE III

Food	Amount	Cal.	Pro.	Ca.	P.	Iron	A	B	C	Laxative
milk	2 qts.	1500	71.	2.6	2.0	.005	+++	+	+	—
cornmeal		1000	30.	.06	1.0	.008	?	+	?	++
cabbage	2 cups	100	5.	.14	.09	.003	++	++	++	++
fat	4 tb.	400	.....	.....	.....	.....	.....	.....	.....	.....
	Total	3000	106.	2.80	3.1	.016	+++	+++	+++	+++

ENTIRELY ADEQUATE

TABLE IV

Food	Amount	Cal.	Pro.	Ca.	P.	Iron	A	B	C	Laxative
milk	2 qts.	1500	71.	2.6	2.0	.005	+++	−+−	−+−	−−−
potato	5 cups	1000	26.	.1	.7	.015	—	++	++	?
fat	5 tb.	500	—	—	—	—	—	—	—	—
	Total	3000	97.	2.7	2.2	.020	+++	+++	+++	+++

ADEQUATE

as pies, cakes, cookies and sweets in general. How does such a diet measure up to the standard? A study of the table shows it to be extremely poor in calcium and doubtless likewise poor in vitamins. This is in accord with the statement so frequently made by nutrition specialists that the American diet is more likely to be low in calcium than in any other constituent. The addition of a pint of milk and one serving of vegetables to this diet would completely change its character, though these alone would not entirely raise it to complete safety.

How to Advise That Children be Fed

It is possible, then, as we have seen, to secure an adequate diet in a variety of ways. How then shall we advise that children be fed in order to be certain that all their bodies' needs are fully covered? And can we formulate our advice in such a way that "even a wayfaring man though a fool need not err therein." I believe we can.

Milk

It is evident from the foregoing tables that milk must play a big part in the diet of children. The term "indispensable food" which is often applied to it, is literally deserved; for though an expert might devise a diet lacking in milk which would supply all the needs, the task would not be easy; and it may be safely assumed that any diet which does not include milk is lacking in calcium so necessary for teeth and bone formation, in the best growth proteins, and in one or more of the vitamins.

TABLE V

Food	Amount	Cal.	Pro.	Ca.	P.	Iron	A	B	C	Laxative
milk	2 qts.	1500	71.	2.6	2.0	.005	+++	++−	−+	−
oatmeal		1000	42.	.17	.9	.010		++		+
fat		500	.....	.....	.....	.....	.....	.....	.....	.....
	Total	3000	113.	2.8	2.9	.015	+++	+++	+	+

TABLE VI

Food	Amount	Cal.	Pro.	Ca.	P.	Iron	A	B	C	Laxative
bread		1500	52.	.16	.50	.005	—	—	—	—
meat		500	70.	.02	.70	.01	—	some	raw some	—
potato		300	8.	.05	.20	.005	—	++	++	?
sugar		500	.....	.....	.....	.....	.....	.....	.....	.....
fat		200	.....	.....	.....	.....	.....	.....	.....	.....
	Total	3000	130.	.23 very low	1.40	.020	— very low	+ ?	+	?

AN ADEQUATE DIET FOR A CHILD OF 4-5 YEARS

TABLE VII

Food	Amount	Cal.	Pro.	Ca.	P.	Iron	A	B	C	Cost
milk	1 qt.	672	30	1.16	.90	.0023	++	+	+ ?	$0.13
spinach	½ cup	25	2	.07	.07	.0037	+	+	+	.03
orange	1	75	1	.07	.03	.0002	+	+	++	.05
oatmeal	2/3 cup	100	4	.01	.11	.0010		+		.004
egg	1	70	6	.03	.09	.0015	++			.040
potato	1	100	2	.01	.07	.0015		+	+	.006
bread	5 sl.	250	9	.02	.08	.009				.021
butter	1¾ tb.	175					++			.040
sugar	2 tb.	100								.004
Total		1567	54	1.37	1.35	.0110	+++	+++	+++	$0.325
½ adult standard		1500	40	.40	.80	.0075	+++	+++	+++	

The amount of milk actually required by a young child is not a matter of general agreement. All do agree that at least a pint a day should be provided for every child; most believe a pint and a half is more desirable, and "A quart of milk a day for every child" is a slogan adopted by many nutrition specialists. Recent work by Sherman and Hawley[4] seems to offer evidence that calcium equilibrium in children of school age is not secured on much under this amount. To quote from their conclusions:

"Carefully controlled experiments, with diets containing systematically varied amounts of milk, lead to the conclusion that one quart of milk per child per day is the amount required for optimum storage of calcium, and presumably, therefore, for optimum development of bones and teeth. - - The investigation as a whole emphasizes the conclusion that, however good the dietary in other respects, each child should receive a quart of milk in some form each day; and that this standard of milk consumption should be maintained at least up to the age of fourteen years."

Assuming, for the sake of concreteness, that a four or five year old child needs about half of the requirements of a man, we see from Table VII that the quart of milk has gone a long way toward meeting this requirement. Protein and calcium are already taken care of by the milk as probably also are the phosphorus and vitamins A and B, and nearly half of the calories as well. We need, in addition, a certain source of vitamin C, since this vitamin is largely destroyed by heat, some additional iron, and calories.

We next advise, therefore, that the child be given at least one generous serving of vegetable, preferably one of the leafy ones, for the sake of the iron and vitamins which they supply, and in addition at least one fruit, and preferably two, one of which should be uncooked, as an orange, to add more minerals and vitamins, especially vitamin C.

One or more servings of a whole cereal as oatmeal, Pettijohn's, whole wheat bread, makes a valuable addition to the iron account, as does also potato if baked or boiled in its jacket so that the minerals are not lost.

When the family can afford it we advise that an egg, or at least the yolk of it be incorporated into the diet in some way for the sake of its valuable phosphorus and iron. When this is out of the question, larger amounts of whole cereal or of vegetable may be used in-

[4] "Calcium Requirements of Children." H. C. Sherman and Edith Hawley. *Journal of Home Economics*, September, 1922, Vol. XIV, p. 413.

stead. If the milk used is much less than a quart, it is essential to add a whole egg or meat for some extra protein. With a quart of milk, the protein needs are taken care of and meat and egg white are therefore optional, during the earlier years at least.

With bread and butter and small amounts of sugar in simple desserts to make up the calories, this diet as may be seen totals generously above our assumed standard; enough above, let us hope, to allow for the losses in cooking which have not been taken into account here. It might be thought that the calcium and phosphorus are enough above the half of an adult's needs to warrant cutting down the milk. It is only necessary to recall the conclusion of Sherman already referred to that the children of his experiment appeared to need one gram of calcium daily or actually more than an adult. It is altogether likely that proportionately large amounts of phosphorus will likewise be found to be desirable.

If a mother will faithfully give these foods daily in the amounts suggested, if she will hard-heartedly restrict the amount of sweets and never on any account allow it between meals, if she will have all foods simply cooked and served at unfailingly regular hours, if she will see that her child has long hours of sleep and plenty of fresh air and sunshine, if she will see that he comes to his meals rested instead of "too tired to eat," she can be fairly certain that he is having the requisites of good nutrition. His appetite and his weight curve will be her best guides as to whether the total quantity of food is sufficient.

Variations are, of course, possible from the scheme I have outlined, but no omissions should be made unless the food which is to replace one is really able to take its place. In the absence of knowledge, safety lies in adhering strictly to the plan described.

This ought not to be a difficult nutrition program to follow. The diet is specific, yet it allows for all needed variety in the choice of fruits, vegetables, cereals, meats, desserts, and methods of preparation; it is simple to prepare, and need not cost over thirty-five cents a day for a four or five year old child. Yet the number of children having this diet, or variations from it, which are still adequate, is indeed small as has been shown. The most common failings in children's diets are worthy of consideration.

Common Faults in Children's Diets

One of the most common, as well as one of the most serious faults with children's diets, is the limited use or total omission of milk. In the Gary study, only nineteen per cent of the children were having even the pint minimum, while more than half (fifty-seven per cent) had no milk at all to drink. In several nationality groups fully three-fourths of the children had no milk to drink, and nine per cent of the children of all groups had no milk at all either in food or as a beverage.

In view of the importance of calcium (of which milk is the only liberal source) in tooth formation is it surprising that 80 per cent of the children in the poorest diet group had carious teeth as against the 10 per cent of the best diet group who had them? That haphazard and insufficient use of milk is not confined to Gary nor the poor sections of our cities need not, I am certain, be argued before this group.

Vegetables, which we have seen are so necessary for minerals and vitamins, are conspicuous by their absence from too many children's diets; oatmeal and other whole cereals are generally disliked, and hence not eaten; and eggs, either because the child does not care for them or for other reasons, are very little used. In the Gary study, 60.1 per cent of the children had no fruits, 36 per cent had no potatoes, 77.6 per cent had no whole cereals, 50.4 per cent had no vegetables,

other than potatoes, and 57 per cent had no milk to drink.

We have indicated that omissions may be made if other foods capable of replacing them are added. In this instance such was assuredly not done. Nearly half of the children (45.5 per cent) lacked as many as four of the foods we have said should be included to insure adequacy—milk, vegetables, fruits, cereals, eggs, potatoes. The result is a diet of white bread, meat, potatoes, coffee, and sweets, such as we have already found to be seriously lacking in several important constituents, notably so in calcium.

Sweets Should Be Restricted

From my study of children in the health classes for children which we have had for several summers now at the University, as well as from general observation, I have been forced to the conclusion that it is the habit of indulging indiscriminately in sweets and trash in general, especially between meals, which is in a large number of cases the root of the whole evil, particularly in the better homes. One almost comes to regard a chocolate bar, an all-day sucker, or an ice cream cone as a regular part of a child's equipment, so constantly do the children one sees on the streets seem to be consuming them.

What does the sweet or candy habit do to the diet, and to the child, we may ask. It creates a dislike for the bland foods like milk, cereals, vegetables; it upsets the digestion; it destroys the appetite for meals; it takes the place of foods which furnish other things than fuel, the only thing which sugar can contribute. Sugar added to a diet containing all the necessary foods as a source of extra fuel for excess activity is allowable, often desirable. It is not in itself harmful. But eaten in such quantities and at such times as to push out milk, whole cereals, and vegetables, it pushes along with them their minerals, vitamins, and growth proteins, and brings nothing to take their place. Table VIII shows the effect of such substitution of sweets in the diet outlined above. Fully two-thirds of the calcium, phosphorus, and iron have been lost by the change and the supply of vitamins dangerously diminished. Such a diet could not possibly provide for normal growth of any

EFFECT OF SWEETS

Table VIII

I *Diet as planned*				II *As chosen by child*		
	Calories		Other Contributions	Calories	Other Contributions
milk	672	+	Pro. Ca. P. A B C	milk 160	Pro. Ca. P. A. B.
spinach	25	—	Iron A B C	orange 75	A. B. C.
orange	75	—	A B C	flakes 50	
oatmeal	100	—	Iron P.	meat 100	Iron P.
egg	70	—	Iron P. A	potato 100	Iron P. (mashed)
potato	100	—	Iron P.	bread 150	
bread	250			butter 100	
butter	175			sugar 100	
sugar	100			candy 200	
				cake 300	
				ice-cream cone 150	A. Ca.?

Food Value of the Above Diet

	Cal.	Pro.	Ca.	P.	Iron	A	B	C
I	1567	54	1.4	1.4	.011	+++	+++	+++
II	1500	33	.5	.5	.004	?	?	?

part of the body, especially the bones and teeth. Whatever truth there may be in the sugar fermentation theory of dental decay, it is certain that when children live on diets, such as I have described, the lack of building materials on the inside of the tooth is sufficient in itself to explain any amount of poor teeth structure.

We come next to the very practical question: How can conditions which I have pictured be remedied, and better nutrition of children be effected and assured? In short, how can these children be put on diets which can provide for their bodies' needs and a normal health program in general be established? In this paper, which was designed primarily to open up the problem, the methods of attacking it can be but briefly described.

Education of Parents

Obviously the most logical procedure is to educate the parents concerning the food needs of children and to convince them thoroughly of the importance of consistently providing them, at whatever cost. It is surprising, I was about to say, the amount of ignorance and misinformation among so-called educated people on the subject of child feeding. On second thought I prefer to say it is not at all surprising considering the fact that not one mother out of several hundred, and not one father out of thousands has ever studied even the elements of the science of nutrition, a knowledge of which does not come with parenthood, in spite of the popular notion to that effect, any more than a knowledge of dentistry comes with the purchase of a dental chair and instruments.

We are now offering in our University a simple course in nutrition and dietaries for the general student which has no prerequisites. We have done this in the belief that all people, who eat three meals a day, and the large number of whom will have the direction of the feeding of children as well, should be intelligent about the vital problem of human nutrition. We find that we can in this one course give students such insight into the subject as to enable them to handle all ordinary feeding problems with intelligence. Most of the students begin at once sensibly to apply their knowledge gained to their own diets, and I venture to say, that their children when they have them, will be better nourished and otherwise better cared for than those of mothers of equal intelligence who have not had even this small amount of training. Similar work in other institutions and in high schools is reaching a certain small number of the girls, and will help in a measure to improve the nutrition of the children of the next generation. If it could be so extended as to insure that all fathers and mothers might have this fundamental knowledge of child nutrition and with their knowledge a real conviction of its importance, we could, in one generation, raise the standard of child nutrition to an astonishing degree, I am convinced. But this is looking into the future. It does not solve the problem of the children already here who are below the optimum of nutrition and these are our immediate task.

Education of Children

When children have reached school age with faulty nutrition and habits of living, teaching the parents alone is of little avail. They have lost their chance. The most successful method has proved to be the teaching of the children themselves. Thus nutrition classes for children—too largely so far confined to the underweight groups—have become a popular and an effective measure. At the meeting of the Chicago Dental Society two years ago, I described the work of the Health Classes for children which we conduct at the University each summer, and other quarters as well.[5] We find—as do all others who conduct such classes—that we can take these children

[5]The Child Health School. The United States Department of Education, Washington, D. C.

who dislike milk and vegetables, who continually eat trash between meals, who go to bed late and at what hour they please, and by interesting them in their own condition, by teaching them in as graphic and interesting ways as possible what they ought to eat and why, and by helping them to learn to like all wholesome foods through their noon lunch; we find we can send these same children home demanding the things they have heretofore refused and ready to put themselves to bed at a regular early hour and carry out other difficult requirements. We grant you that this is putting on the children's shoulders responsibilities that rightly belong to their parents, but it must be remembered that they have already been carrying the responsibility, deciding what they will and will not eat, and at what hour they will go to bed. So we are not imposing on them an additional burden, merely giving them some help in handling it. It is always amazing to parents to see the sudden changes in their children's attitudes and habits when they become members of such a group. Such nutrition and general health instruction of children is gradually finding its way into the public schools and will in time become a recognized part of the school program.

Concerted Attention of All Children's Specialists

However hopeful the future looks for the better training of parents, and for the instruction of children of school age, the fact remains that much of this is in the future and the problem of the preschool child, and to a large extent of the school child is a present one. It behooves all of us, therefore, who are dealing with children and with their parents, to do all that we can in informal ways to spread the gospel of better nutrition of children—teachers in the public schools, physicians, social workers, nutrition specialists and dentists.

I cannot at this time forego the opportunity of suggesting to this group my belief that the dentist has an unusual opportunity for helping in this movement for better feeding—as well as a strong personal motive for desiring to do so. He has an excellent chance when the child is in the chair to put in a word of advice concerning the importance of right food for building and preserving a sound set of teeth. I know of no argument which so impresses either adults or children as does the tooth one, and it is doubly effective when given by the dentist himself. People do want good teeth and will do almost anything the dentist says on the mere chance of postponing dental decay. An illustration of this came to me but a few days ago. A child, with unusually poor teeth, had just completed her series of visits to the family dentist. "Do you make your own bread?" asked the dentist of the mother. When she replied "No," he added, "Well, I want you to do so from now on. This child's teeth are lacking in mineral salts and she needs homemade bread." So the mother, anxious to improve her child's teeth, has been baking her own *white bread* ever since. Of course the advice of the dentist was bad—there being no food much poorer for teeth building than white bread, whether home or factory made—but think how much good he might have done had he advised right!

It cannot be expected that a dentist be a specialist in nutrition. There are certain things, however, which he can safely advise. These I have already suggested—milk to the extent of at least a pint, green vegetables, fruits, whole cereals, and *less candy and sweets.* Much could even be done in an informal way by the use of simple posters hung in the dentist's office to teach their silent lesson in the intervals of waiting. I need not suggest more save that the

same methods which have been found effective in bringing the toothbrush into better repute may well be employed also in a campaign to improve the diets, and thereby the nutrition of the whole body, and consequently the nutrition of the teeth. Better nutrition of the child from prenatal life on is strictly a part of preventive dentistry—to me and to many of you I am sure, the most worth while part of the dentist's job.

Discussion

L. O. Frech, Decatur, Illinois: It is a fact that people in general and parents in particular do not appreciate the true meaning of nutrition. The word nutrition means, as defined, "physiological maintenance of life and growth." Our maintenance of life and growth then, depend upon the physiological processes functioning within our bodies. Physiological function is dependent upon metabolism, metabolism being the process of destruction and repair, constantly going on in our bodies. If we have a balanced metabolism, which means that the process of repair is keeping up with that of destruction, then the body is at a standstill as to gain or loss of weight. If the process of repair is greater than that of destruction, we then have a gain in weight or as the common expression has it, we are taking on weight. If the process of destruction exceeds that of repair we then have weight loss. To maintain metabolic balance or to keep cell repair on a par with cell destruction it takes a certain number of calories, about three-tenths of the total requirement. A calorie is that unit or amount of heat required to raise the temperature of 1000 cubic centimeters of water, or about one quart, one degree centigrade. When food is taken into the body it acts as fuel, is burned by the body and delivers a certain definite number of calories or heat units. We know that when a ton of coal is burned in a furnace it delivers up so many heat units. The body acts just as a furnace, it consumes the fuel which leaves a certain amount of residue, as does coal, depending upon the quality of the fuel consumed.

In buying fuel for the furnace most people are very careful to select a fuel of good quality, in fact the economic consideration is of the greatest importance. They want coal which will give them the greatest number of heat units at a moderate price. In buying food these same people are not so insistent that their food give them the highest number of heat units, but rather that it is pleasing to the eye and tempting to the palate. While it is perfectly consistent that the food be attractive, first consideration should be given to its digestibility and adaptability to the needs of the body.

Children eat what their parents feed them so if you see a poor little, undersized, malnutritioned child whose diet lacks proper supervision, pity the child, but censure the parents. The needs of nutrition clinics grow out of neglect by the parents. Some parents cannot become educated to the needs of their children, some will not, but too many do not take the time.

Practically every child is born into the world physiologically perfect. The digestion is good, the appetite is good, the child sleeps well and has no bad habits. Whatever condition develops after birth is usually brought on by some external cause. Someone feeds him too much, or too fast, or gives him a food he cannot digest; some one exposes him to temperatures to which he is unaccustomed; someone rocks him or handles him too much, or someone applies a remedy which is not needed, and causes an irritation. Someone does something to cause his little troubles, which later often grow, by further abuse, into larger troubles. As these minor troubles manifest themselves by symptoms, more artificial remedies are applied which only add fuel to the fire.

God, in his wisdom, provided breast milk for the infant, which in most cases agrees with and nourishes him, but in many cases even this fails. With our artificial methods of living nowadays many mothers have become unfit to provide food for their infants, thus condemning them to artificial methods of feeding. One step in the downfall of nutrition is indigestion, which may be caused by unsuitable mother's milk; by unsuitable artificial food, by suitable artificial food with faulty methods of feeding, or by a suitable food whose elements are in disproportion. If the digestion in infancy is once upset, it is usually a difficult task to get that particular food to agree. If an infant cannot digest cow's milk, it seldom is the fault of the baby, nor is it the fault with the food, but it is with the directing of the feeding.

Another reason for poor nutrition is faulty assimilation. The digestion may be good, the quality, quantity and combination of food elements may be right, but through some pathological injury or condition, absorption of the digested food does not properly take place and as a result the nutrition suffers.

Still another and a third reason for poor nutrition is faulty metabolism. The food,

digestion and assimilation being perfect, the body cells may still be unable to utilize the food substances and use them for regeneration, for building up or replacing worn out or degenerated cell material. Again, if worn out or degeneration cell material is not properly disposed of through the excretory functions of the body, the result is the retention of harmful waste materials which throws the organism into a state of unbalanced equilibrium and the result is a poisoned or highly toxic condition.

Children during the first year of life are, in most cases, fairly well cared for or rather provisions are made for their care, but if the parents do not care to take advantage of these provisions, the child, of course, suffers. At this age nature provides for these children and man has established welfare clinics where mothers can get advice. As long as the child is helpless, must be carried and must be fed, he receives the utmost attention, in most cases, from the parents. From two to six years, which is known as the age of neglect, the child is left to shift, more or less, for himself. Here the leniency of parents manifests itself, it has not done so before, sympathies are created and benevolence toward the child becomes a household byword. Even Grandma humors the child. At this time and from this time on restriction is needed. The child is irresponsible, its powers of judgment are undeveloped and it yields to a well developed but a perverted taste. Children do not need a great variety of foodstuffs, but a well regulated, balanced diet of bland, nourishing food. Children want things because they are taught to want them; they want food which is unsuitable for them because some one erred when they gave them "just a taste of this or a taste of that" food eaten by adults, highly seasoned and very palatable, but also very indigestible. This is the time that parents should use their judgment and not leave it to the child to decide, as this is not a question of what the child wants, but what he needs and should have to properly nourish him. At birth a child's digestive powers are no more developed than are its muscles or bones, but as it grows and develops, so develops the digestion. No one would consider placing a four-year old child in the harvest field and expect it to do a man's work, because of its lack of development and inability to perform such hard tasks, but I have seen four-year old children take their place at the table and try, by permission of the parents, to consume and digest a harvest hand's dinner. If a child cannot do a harvest man's work, it cannot digest a harvest hand's diet, for its digestion is no better developed than its muscles. Some small children do eat the harvest hand's diet, 'tis true, but they pay dearly for it at some time because nature has her own peculiar laws and exacts her penalties.

If you would have your child well nourished there are certain, well-defined laws that must be obeyed; certain rules that must be followed and regulations which must be adhered to. The food must be well chosen; it must be properly prepared; it must be attractively served; it must be taken at regular intervals; it must be eaten in moderate amounts; it must be consumed slowly and be well masticated, and food must not be attempted when the child is out of sorts. Children should not be fed warmed over food, hash, highly seasoned food, and they should not be allowed to wash their food down with liquids. They should not be forced, begged, cajoled, or bribed into eating their meal because if the appetite is not there the food will positively do them harm. They should not be allowed to eat when they are very tired or exhausted, when they are excited or sleepy. They should not be allowed, if possible to prevent, to exhaust themselves or become tired out at play or work; they should not eat between meals; they should not be kept up late at night nor should they be irritated by constant scolding. Children of school age up to puberty, should be in bed not later than 8:30 and younger children of pre-school age should be in bed by from 7 to 8 P. M. They should not be permitted to attend moving picture shows except on rare occasions; they should not be allowed to sleep late or lie in bed mornings; their habits should be attended to promptly; they should be out of doors as much as possible as there is no better aid to good nutrition than sunshine and air. All defects and minor ailments should receive attention, and they must not be humored and spoiled.

The "whims" of the child should not be ignored; those that are reasonable and justifiable should be granted, the others rejected. It is my belief that the chief business of parents is, or should be, caring for properly and looking after their children; that bringing up children properly is one big job and one that deserves careful attention and most of one's time. Care-free parents usually have care-free children, and in nine out of ten cases parents can be judged by their children.

We frequently hear the expression "a delicate child." The usual method but an erroneous one, of judging the child, is by the appearance. Many healthy looking children are indeed, truly delicate. A child may appear ever so rugged and still be a fit subject for all sorts of diseases. The child who contracts "colds" easily, but who may appear

rugged, is a delicate child. A child may be well nourished and still lack immunity. There are many conditions to which malnutrition is only secondary. All of our malnourished children are not subjects of a poor diet by any means: in fact, I believe that many malnourished children are victims of other conditions than poor diet. Poor hygienic surroundings, bad personal hygiene and improper sanitation play a big role. Noninfectious pathologic conditions are frequent causes. Infections, I believe are the most frequent causes.

In drawing conclusions as to the cause of malnutrition, it is first necessary to make a complete physical examination. If no pathological condition exists and infection can be ruled out, one may rightly conclude that the cause is purely a dietary one. In attacking malnutrition in this manner it is usually a relatively easy matter to clear up the condition, but where always handled from a purely dietetic standpoint, many failures are encountered. Assuming that a given case of poor nutrition is due to diseased tonsils or carious teeth, it is, in most instances, an easy matter to make the child gain in weight if given forced feeding, and by forced feeding is meant an extremely high caloric diet, but just as soon as the diet is reduced to normal the child's weight starts dropping and in a short time approaches that point from which it started. If forced feeding could be continued indefinitely, all might be well, but this is impossible for the continuation of forced feeding sooner or later sets up an indigestion which in turn causes weight loss.

One of the most common methods of forced feeding in daily use at the present time is the feeding of milk between meals. I do not wish to imply, however, that every child who drinks milk between meals is being overfed. In those cases where parents cannot, or will not feed their children milk at meal time, this is a splendid practice, but in cases where malnutrition is secondary to pathologic conditions or infectious processes, milk is taken to the exclusion of other vital foods, for we know that in most cases any food between meals takes the appetite, but does not remove the cause or the pathologic condition. Large quantities of milk, we know to be positively harmful for this reason. Children with these focal infections invariably have a poor appetite and a food between meals, even milk, may send them to the table with an actual distaste for food. Our Creator has wisely provided mother's milk for infants. Cow's milk was intended for calves primarily, but has long since been dedicated to the needs of the human family. Milk is like any other food, if used rightly and in proper amounts, it is an excellent food.

It is a mistake, one commonly made today, to assume because a child is gaining in weight and growing in height that he is in good physical condition. It does not necessarily follow because of normal weight that his diet is correct, or that he is well nourished. Every day we see examples of a high carbohydrate feeding where the infant looks to be well nourished, is normal (usually above normal) in weight, but on close inspection and examination we find the reverse to be true. A fat baby does not necessarily mean a healthy baby. Bone development, nerve stability and muscle tone must be considered as these and not weight alone are the tests of good nutrition.

The three important periods in the development of a human being, those periods in which the whole state of physical welfare and degree of health in after life are determined are: infancy, from birth to two years; preschool age, two to six years; and from six to fourteen years. Infancy is that period in which the child adapts himself to a new world, to new surroundings, to different temperatures and to his environment. From two to six years he is adapting himself to new foods, learning when, how and what to eat. From six to fourteen years he is adjusting himself to the needs of his body and carrying out the principles of nutrition that he learned in the previous period, be they correct or incorrect. Feed a child correctly from birth to fourteen years and he will seldom go wrong in his diet. He may, of course, at times when with unknowing friends practice little indiscretions, and this will not hurt him, but when living his normal, quiet life, he will stay on the old diet.

Children are not expected to know the needs of the human body, but they are expected to learn them. Parents should not only study, but should know the needs of their children. Teaching children the principles of nutrition is not giving them the chance that they deserve, because much damage is done before they are old enough to appreciate the value of a correct diet, but it is preparing them for parenthood whereby they may give proper supervision to the diet of the next generation. In teaching present-day parents the needs of good nutrition we are also teaching the children, because what the parents learn and practice will automatically be imparted to the children. There is really no excuse for the parent not having at least some knowledge of these things as many good and instructive articles appear frequently in the better magazines. As to the needs of

present-day children I find that 99 per cent of them need attention in one way or another. In the examination of 200 children, who were over two years of age, only 2 were found near physically perfect as measured by present-day medical standards. Many parents go on the assumption that their children are physically fit, and judging with the untrained eye they are, but when submitted to a gruelling examination, defects which lurk beneath the surface are brought to light.

Our present-day method of living is responsible for many of our nutritional ailments. The human race is moving at a swift pace. We are under a heavy strain mentally and physically. Society is demanding more and more; the economic pressure is becoming greater and greater; business competition grows keener and keener. Fashion decrees that our children wear socks, low neck dresses and insufficient clothing long before the frost is out of the ground in the spring and long after the snow flies in the fall. Is it any wonder that tonsils are slaughtered by the wholesale? Society demands that they learn to dance even before they know their A, B, C's; that they take music lessons and spend hours in practicing when they should be recreating in the open after long hours of school and confinement indoors; that they attend parties and eat all the delicacies invented by mankind which are soothing to the taste, but hazardous to the appetite and nutrition; that they study French or Spanish when their mental faculties are already overtaxed by, and their nervous systems at high tension from school studies, which are too far advanced for many of them. For economic reasons they are started to kindergarten soon after they learn to walk, and are pushed and crowded through schools. They are urged to eat and are fed upon canned foods as meat, soup, vegetables, fruit and milk (which cannot possibly take the place of fresh food); bread and cereals in which the essential elements or vitamins are removed; fruit which is picked green and allowed to ripen in transit or in storehouses; eggs which are packed; meat, chickens and other foods which have been kept indefinitely in refrigeration; salted, brine preserved and smoked foods and other foods pickled or preserved by other artificial methods. Is it any wonder that our children are undernourished?

Many parents argue that they, as children, ate whatever they wanted, whenever they felt like it, and all they pleased. Perhaps they did, but the past generation lived under vastly different conditions from this generation. In past generations the mortality rate was high among infants and children, it was a "survival of the fittest" as most of the delicate ones and weaklings died off, but we, of this generation, are lowering the death rate, saving the weaklings and prolonging the average length of life, and we are doing this in spite of our low standards of living, and the high pressure of existing economic and social conditions.

If we could but make parents understand that fondness of their children should not be expressed in laxity with them, in turning over the direction of their lives to the children themselves, results would be startling.

Parents, I beg of you, in supervising the lives of your children, the highest duty that God has bestowed upon men, obey the laws of nature; observe the rules of common sense; direct them instead of following them, that they may build strong bodies; develop keen intellects; be content, happy and healthful, that they may grow into manhood and womanhood donors to and not charges of society and the state, an economic acquisition and not a burden. This trust is not to be regarded lightly; these charges should not be neglected; the serious task of parenthood should be appreciated and faithfully done, for after all, you are only the guardian,—these are God's children as well as yours.

Edward H. Hatton, Chicago, Illinois: You have been told on one hand that if your child—most of us have children—is underweight, is sickly, has prominent, wing-like shoulder blades and spindly limbs, it is the victim of malnutrition. On the other hand, if the child is plump, fat and well fed, beware, it is pathologic.

With all respect to the authorities, the standards for well-nourished children are not absolutely fixed. Each worker has his own set of standards and you have heard one such ably presented; it is one to which I can subscribe; nevertheless there is an individuality in children, an individuality that is estimated only with great difficulty on the basis of rather arbitrary standards. Because of such fundamental differences in children I have heard adverse criticisms of such splendid work as Dr. Roberts' to the effect that "there is nothing in this diet business," and "So-and-So and his brother were fed just alike and the results from the point of nutrition were radically different." There is something in heredity, something in the individual tastes and more or less instinctive choices and rejections of two or more children which alone make for a vast difference in the end result nutritionally, all of which disposes of this objection to the advantage of the nutrition expert.

As dentists we may demand of foods that they supply eight requirements:

1. We eat to grow, to develop and in-

crease in size. Growth requirements are supplied largely by suitable proteid containing foods; a sufficient mineral and vitamin content is just as needful.

2. Foods must replace the constant waste. May I emphasize only the item of calcium waste with a rather homely set of comparisons. If this is supplied by milk alone there is required—merely to replace the waste, and not to furnish any growth requirement—between a pint and quart of milk *every day*. If this is supplied by white bread, not less than four fourteen ounce loaves (the average size of bakery bread) and probably about eight are required. A generous head of cabbage weighing nearly two pounds will also make up a day's waste. Such amounts are absolutely essential for the maintenance of the calcium bearing tissues.

3. Foods must supply energy — largely found in sugars, starchy substances, fats and oils.

4. Foods must supply the mouth with exercise. Certainly, orthodontists as well as others are firmly convinced that the proper and symmetrical development of the mouth and face is greatly influenced by the exercise that comes from the mastication of foods. Diets that do not furnish such exercise are deficient.

5. Foods must also supply the remainder of the gastro-intestinal canal with exercise. This has been adequately discussed under the head of bulk and indigestible residues, and from the standpoint of preventing constipation.

6. Foods must contain an adequate supply of the perishable substances (vitamins) that prevent certain diseases as scurvy, rickets, etc.

7. Foods must contain an adequate amount of salivary stimulants.

8. Foods must satisfy to a reasonable degree the demands of appetite. Normally we eat because we are hungry. But there is a difference between a normal appetite and abnormal, more or less depraved tastes—such as the craving for sugar and sweets.

The paper in two places emphasizes the parts played by exercise, sleep, sunshine and fresh air in promoting adequate nutrition. May I re-emphasize the importance of these factors.

Perhaps something ought to be said with respect to the sophistication of food as practiced today in the manufacture of prepared foods; many processes undoubtedly do deprive foods of needed constituents and needed properties.

Amongst certain groups in our larger cities, many faulty dietary practices occur because those of foreign origin are trying to copy so-called American standards by adopting the American food habits especially the exclusive use of white bread, muscle cuts of meat, and the buying of foods partly prepared in cans and packages. In American families the children, as a rule are over-cared for rather than under-cared for from the standpoint of nutrition. There is too much preparation, too nice a preparation of food and too little realization that it is simple foods that are needed, just such dietaries as have been presented by Dr. Roberts.

Miss Roberts (Closing): In referring to standards, you will see from my paper that I studiously avoided reference to the weight standards. I do not believe weight is a perfect standard of nutrition of children. The chart I showed of the condition of the children in the Kentucky section was not based on weight alone. We took every possible factor into consideration. A physician who is accustomed to examining children, judged the nutrition, taking into consideration the musculature, the condition of the teeth, the color of the mucous membranes, the general posture appearance and all factors that are available for determining the nutrition.

I do not disregard heredity as a factor in these cases, but I do not believe that we should blame heredity for everything. Heredity does play an important part, but because it does, many people are too ready to ascribe everything to it. You can take any number of children supposed to be poor in nutrition because of heredity and by putting them on a proper diet you can make normal children out of them. You may not make children of thin parents into fat children, but they can be well developed and well nourished by instituting proper diet and hygiene.

BETTER DIAGNOSIS IN FOCAL INFECTION WORK

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(Read before the Wisconsin State Dental Society, Milwaukee, Wisconsin, July 10, 1923)

TIME was when the field comprising the prevention of disease as supervised by the dental profession was confined to a very limited area. Many problems have been presented in the past, are today waiting, and will arise in the future, for solution. Some of these are of a mechanical nature, and have to a very large degree been satisfactorily answered. We can expect the balance to be met without great friction, and with a good deal of ultimate satisfaction. There are, however, many problems demanding solution in both dentistry and medicine which will require training based upon scientific effort. If the profession is in need of one thing more than another, it is better diagnosis; and that applies to the medical as well as to the dental profession.

We have now for a number of years discussed the greatest of all subjects in both dentistry and medicine—namely, the source of disease, particularly when it is located in the oral tissues and may be acting as a focal infection, are we concerned. Outside of injuries, most diseases occur as a result of infection foci. An injury itself is many times dependent upon the removal of the foci for its ultimate cure; it is particularly noticeable that when a patient receives an injury to articulating surfaces that are subject to traumatism, such as would be the case in an injury of the foot, which would yield easily to rest, in the presence of infection foci, the process of resolution will be very prolonged.

It matters not whether it is tuberculosis, typhoid fever, cancer, or syphilis; in the beginning disease starts on an external surface. And when I say "external surface" I do not mean alone the integument covering the external surface of the body, but also the intestinal tract and openings that communicate with the external surface. If it is removed in its entirety, with some of the surrounding tissue, and early enough, disease may be eradicated.

A knowledge of the things that make for better diagnosis should be our aim. It must in justice be said of our schools, however, that they are now teaching young men the things that will enable them to call to their aid impressions gained from a broader vision based upon scientific training. Particularly is that true of the Marquette University Dental Department, of which Dr. Banzhaf is the Dean. He has equipped the finest infirmary in the world. The students are provided with pathological laboratory equipment and assistance. They have but a step to take from their chairs to a diagnostic laboratory to confirm or contradict their conclusions. What a wonderful aid that system must be in the training of young men! It bridges over

at once the space in the ordinary school of the past between the scientific laboratory and the practical operations, so that when these young men are turned out to practice their profession they will not only be scientific men, but scientific practical men. In other words, the schools are developing diagnosticians who will combine scientific training with that intuition which comes as a result of clinical observation.

The profession has made mistakes in its efforts in the solution of dental problems. Not all, but many of them, have relied upon the dental radiogram too much, relying upon it as if it revealed the real pathology, when it only shows an area that is suspicious of infection. That it was once infected we are sure, but the radiogram does not tell us the type of infection it contains. We know, however, the type of infection it is liable to contain. We did not go often enough, in the past, to the laboratory to get the pathological findings or the tissue changes, which tell a wonderful story.

While we are discussing tissue changes, I am going to discuss the opportunity afforded the dental profession to accomplish a service in the prevention of cancer. It is claimed, and is nearly always true, that results in cancer of the mouth should be close to one hundred per cent successful. That is based, however, upon the assumption that we can supervise our patients, and keep them under observation frequently enough so as to detect any tissue changes that may occur; to recognize early, if you choose to call it that, the pre-cancerous lesions, and to remove them in their entirety.

Deaver (1), in discussing the subject of cancer before a meeting of dentists, calls attention to the fact that Crile, after an examination of the literature, found that, in four thousand five hundred cases of cancer of the head and neck, in only one per cent were they able to demonstrate secondary foci as a result of metastasis. If that is true, we have a good chance to cure these cases by early removal of suspicious growths.

Early cancer of the mouth is most amenable to treatment, but advanced cancer of the mouth is the least amenable to treatment, and is the most destructive and horrible, from every possible viewpoint. It should be the aim of every practitioner to see his patients at least once in three months, not alone to detect cavities that may arise and to prevent pyorrhea from gaining a foothold, but to note if any changes in the soft tissues are occurring.

Small tumor-like tissue proliferations, that occur between the anterior teeth and do not show a tendency to resolve immediately upon the removal of any possible irritation, should be thoroughly excised at once. They are innocent at the time, but occasionally they become malignant. In the prevention work that we aim to do, the slightest neglect that may result in an irritation may eventually be responsible for a pre-cancerous condition, so that it carries with it a tremendous responsibility—the practice of dentistry.

It is, in the treatment of cancer, more important that patients past thirty years of age are inspected frequently, than those under that age, as it is characteristic of cancer not to appear so readily before thirty years of age. Malignancies do, however, occur at an early age, and I am going to call your attention to one in particular.

A child, eleven years of age, was referred who presented a growth in the region of the left lower second molar. The tumefaction had been opened several times with a view of draining the abscess. An examination of the tissue

comprising the bulk of the tumor itself did not reveal any malignancy, but when the last layer of tissue overlying the sharp cusp of the approaching second molar was examined, it proved to be a spindle-celled sarcoma, which gave it at once a malignant aspect. Radium was used following the operation, and again in about one month. The case has now been standing four years without any return of the disease. I am calling attention to this case because it demonstrates the possibility of a malignancy occurring in young patients.

As to the treatment of cancer of the mouth, there is some dispute as to the best possible way to treat it. There are those who believe in the surgical removal alone, and those who believe in the actual cautery; those who believe in the surgical removal and the application of radium; and then those who believe in the surgical removal and cautery. In inoperable cases Dr. Logan of Chicago is using the electrical coagulation method. The advantage being claimed for it is that it penetrates the mass and destroys the cells better than the cautery, as the cautery sears the tissue and limits the penetration.

Then, too, in the question of diagnosis, there is danger of making mistakes in tumors of the mouth. Frequently a tumor resulting from the wearing of an artificial denture by tuberculous individuals will be mistaken for sarcoma. I recall several such cases, and will mention one in particular:

A woman forty years of age, who had been wearing an artificial denture for a number of years, had gone to her physician because she was alarmed over an enlarged mass in the region of the lower bicuspid. The physician was uncertain as to its diagnosis, and wondered if it might be a retained root. The x-ray demonstrated that such was not the case. He then properly suspected a sarcoma. He referred the patient to me to see if I might aid in the diagnosis.

Having had some experience in a similar case, I came to the conclusion that it was a tuberculous lymphatic nodule; by palpating it and moving it about, I came to the conclusion that it was not malignant, because it was not adherent to the bone or the periosteum; but wishing to give the patient the benefit of scientific diagnosis, I incised into the mass and removed a small amount of tissue. Contrary to what I expected, the simple incision gave freedom to a severe hemorrhage, which yielded immediately to pressure and did not require ligation to prevent a recurrence of the hemorrhage. That made the growth all the more suspicious of malignancy. The patient appeared very weak and emaciated, and, in fact, the simple incision almost brought on syncope. The laboratory findings indicated that it was not malignant, but did not say what it was. I waited for five days, and then cauterized the mass with an actual cautery; after the inflammation, as a result of the cauterization, had subsided, the mass began to diminish, and in three weeks was practically all gone.

I just call attention to this to demonstrate the fact that not every tumor in the mouth is cancerous or sarcomatous. We must differentiate in our diagnoses. We must reduce our method to such a degree of fineness that we are practically sure of our diagnosis without the aid of the microscope; but we must not rely entirely upon it, and we must always give the patient the benefit of an examination of the tissue.

There is a call being made today by the medical profession upon the dental profession to so observe patients as to entirely eradicate cancerous growths from the mouth. I said before that pa-

tients past thirty years should be inspected more frequently than those younger. There are several reasons for this. Cancer is more liable to occur after thirty years of age; and then, too, patients have been establishing and following habits that are apt to irritate the tissue to pre-cancerous conditions at that time of life, such as the use of tobacco, and the taking of hot food repeatedly, as they are likely to burn the same location each time. Then, too, patients are beginning to pass the maximum of their resistance to all diseases at about that age.

Going back now to the subject of focal infection: a great dispute arose, due largely to lack of scientific evidence, as to whether we should extract all devitalized teeth or retain some of them. So many men treated them as Blair suggests treating cancer. Blair says that cancer should be treated like a skunk—it should either be killed altogether or let alone. No doubt that is a proper attitude toward cancer, but it is not always the proper attitude toward devitalized teeth, one being malignant, and the other benign. But as time goes on in the effort to cure disease as the result of focal infection, we must be fairly radical.

In the first place, when we have a rarefied area containing pathogenic bacteria, we should ask ourselves which tooth is most likely to be causing the infection. Experiments and observation have taught us that, while a person may have many areas of rarefaction, it is usually one that is active. If it is one, what type of infection is it liable to contain? Of course, we take into consideration the disease the patient is suffering from, and the symptoms; and so in a gross way we determine whether it is rheumatism, neuritis, myocardities, or nephritis. As a rule, we find growing in and about the apices in that rarefied area some strain of the streptococcus family, and many times it is the streptococcus viridans.

There is one thing that the physician should do when he refers a patient to the dentist—he should send with that patient his laboratory findings and his conclusions as to the diagnosis. And there is one thing that the dentist should do; if, in his judgment, he can prove that the disease is of a certain type, he should communicate his impression to the physician, not by way of criticism, but helpful in character. If he does it in the spirit of ethics, he will find the kindest co-operation and appreciation in the medical man.

To illustrate, I will cite one case. I was asked to go and see a child eighteen months old, who presented the appearance of having the first and last fingers doubled into the palm of the hand, and the toes in the same condition of rigidity, with the entire foot extended. The child had periodical spasms. The gums were lanced eight or ten times without any relief to the child. The picture presented was so typical of animals fed in such a way as to deprive them of vitamin ferments, that I came to the conclusion that it was a condition of malnutrition. I enumerated the things that I thought the child was very likely to be getting, and then enumerated the things that I thought the child was being deprived of. The child was being fed upon pasteurized milk. I suggested to the mother that she furnish the necessary food to the child, such as orange juice, cod-liver oil, raw milk, and some leafy vegetable juices, and stated that if my diagnosis was correct the child would be better in three or four days. I returned in four days to see what improvement had taken place, and, as I anticipated, the spasms were entirely removed, and all except one hand had returned to its normal function.

I cite that case to illustrate that you would not offend the medical man if you correct his diagnosis. On my way back to the office I stopped at the physician's office and told him my conclusions. He thanked me and said that it had escaped his detection. While I am entitled to no great credit for making the diagnosis, yet the point to which I wish to call your attention is that satisfactory co-operation is possible if we are ethical with the medical practitioner, and it gives the patient the benefit of correct diagnosis.

Coming back now to the streptococcal infection that we find at the apices of the teeth and its proper management, there are certain things that arise in our minds as to the best manner to deal with it. One of the things that should come under consideration is the patient's ability to hold in check, by his immunity, the organisms that may be found in the area. That the patient has an immunity is certain, otherwise the patient would not be living to tell the story. It is for us to determine, then, the extent of the patient's immunity.

The very fact that nature granulomatizes these infections is an indication that she is making a supreme effort to assist in the immunization, or to hold in check the infection until the economy has built up its immunity to deal with the infection. Connective tissue, as a tissue, has specialized functions and possibilities of elaboration without a tendency toward malignancy, and nature makes use of it to wall in infection wherever the tissue is at hand. I am not sure but that connective tissue itself has the ability to throw out ferments of an immunizing character, which may, in a way, account for local tissue resistance or immunity.

Then by an examination of the patient's clinical history you will be able to determine whether there is in that patient's family history a tendency that shows a lack of resistance or immunity to that type of infection. For instance, the patient's family history may show a number having arthritis, so-called rheumatism, heart trouble, nephritis, or gastric ulcer; and then it may show the reverse of that. If the patient has a good family resistance, I believe it is an indication at least that one hundred per cent extraction need not be practiced in this case to preserve good health for the patient. If, however, there are individuals in the family of a cardiac, gastric ulcer, and arthritic tendency, some of whom may have died as a result of that infection, it is our unquestionable duty, then, to relieve that patient of that possible source of infection, and to give him that chance against disease that nature seems, in a degree at least, to have denied him.

Focal infection, too, steps into the individual's life at about middle age, as a rule. At any rate, patients past middle life seem to require a higher percentage of extraction in order to cure them than those before middle life. If a patient shows symptoms of myocarditis it is not always wise to wait for the pronounced symptoms. Those of you who have been working in the focal infection field, know that patients have been presented to you by their physician with the statement that he can find nothing wrong with them, except that they complain greatly of fatigue on exertion, and that their pulse pressure or blood pressure may be slightly lower than is normal for their age. That is the type of patient where we can expect a severe myocarditis later on. If we are going to do anything for that patient it should be done at once in order to avoid structural changes such as will weaken the heart muscle itself to the point where the removal of infection foci will be of no avail.

The patient's blood count is an assistance, and should be made every time. If the count is eleven to seventeen thousand, it is, as a rule, an indication of a typical tooth focal infection. If, however, the count is normal, it is well to look for some source outside the granuloma and what may be present in the radiogram.

We may find some types of infection, such as Vincent's angina or amoeba, in large numbers, that do not seem to produce a high white count, but do sometimes give rise to symptoms of systemic disturbance and place these infections within the realm of focal infection diseases.

I cite the case of a man forty-five years of age who had been operated on for an intestinal disturbance. The patient before and following the operation had hemorrhage of the bowels. He was referred for the detection of oral infection, and all the devitalized teeth were removed, but the hemorrhage continued periodically. A microscopical examination revealed the fact that the free margins harbored spirochetae of Vincent's and amoeba in large numbers. The hemorrhages ceased after a constant and severe prophylaxis, to the extent that gum tissue was cut away, the idea being to eliminate the harbor that protected the anaerobic bacteria. Prophylaxis was discontinued, and the hemorrhages returned. Microscopical examinations from time to time showed the organisms still present, but in diminishing numbers. After the usual treatment for spirochetae of Vincent's and the amoeba, nitrate of silver was deposited around the cervical margins of the teeth, and a re-examination proved the absence of both organisms.

We must not get the idea that a normal-appearing mouth is free from bacteria, particularly of the Vincent's angina; we have found it hard in some cases to get rid of Vincent's where there was no pyorrhea, and have gotten rid of it many times where the mouth was insanitary. I think the great reason for this was the patient's inability to gain an immunity in some cases.

We find that there are many people who are Vincent's and amoeba carriers; and while it is true that we find these organisms in the mouth as chronic habitants of it, and while they seem to do no great harm until the immunity is lowered or the bacteria greatly increased, yet when they gain entrance to the mouths of others it is possible for them to do great harm. I have seen many patients who had a disturbance in the back, probably between the vertebrae, that continued when all other infection foci had been eliminated. Clinical experience would seem to tell us that it was that type of infection in the mouth of the patient whose immunity is not great enough to eradicate the infection. Many times we will find the infection upon certain teeth and not upon others. Frequently in that type of mouth you will find it around the free margins of crowns every time you examine for them, because of the harbor that is present and favorable to their growth, which emphasizes the need of perfect-fitting crowns. There may be some local tissue resistance about some teeth, and not about others.

Recently I heard Dr. Goslee (2) of Chicago give expression to a thought in discussing the advantages of fixed removable bridgework. He said it was his belief that when certain teeth had been lost, and bridges had been affixed in a permanent way to others, that the supporting tissue of that tooth increased in its possibilities, just as one of the senses increases at the loss of another. I think that he could have gone farther and stated that the tissue resistance about

a tooth carrying a fixed bridge would be *increased* in proportion to the tissue structural improvement.

Albert N. Crosby (3), in quoting Professor Cannon of Harvard University and T. R. Elliott in their elaboration upon the suprarenal glands, brought to light a very wonderful hormone mechanism, one which helps us in interpreting the action of growth-regulating hormones. When we are about to make a supreme bodily effort the muscles must be supplied with an abundance of oxygen and blood-sugar, the fuel of muscle energy. At the beginning of the increased output of energy the suprarenal glands are excited by messages passed to them from the central nervous system. They throw a hormone, adrenalin, into the circulating blood, which has a double effect. Adrenalin acts on the floodgates of the circulation so that a greater blood supply is furnished to the muscles. At the same time it so acts on the liver that the blood circulating through that organ becomes laden with blood-sugar. Here we obtain a glimpse of the neat and effective manner in which hormones are utilized in the economy of the living cell. It is that influence which is called in and supplies the extra endurance that Dr. Goslee spoke of, and the local tissue resistance that seems to prevail when a tooth is taxed beyond its normal capacity to carry bridges. When you stop to consider, that must be the case, as we all know that certain teeth have carried large fixed bridges without pathology developing for a long period of years.

The examination for Vincent's angina and amoeba should be a part of the routine examination in our regular focal infection work, and I wish to call your attention to the fact that these chronic organisms in the mouth may be the cause of the patient's focal infection disease. It is not a difficult thing to discover under the microscope with a dark field, by putting a drop of normal salt solution on the slide. You will see them if they are there, and you may occasionally see the spirochaeta pallida of syphilis.

Illustration: The chief morphological difference between the spirochaeta pallida and Vincent's is in the acuteness of the angle; and sometimes when you are looking for the one you may find the other, although this is very rare. If you find them you need not tell the patient at once, but tell the physician, and he will thank you for it, as he will in any diagnosis that you are sure of and he is mistaken about. If you can prove your contention, and are ethical about it, he will appreciate your effort. If dentistry had not done its share in this class of work the death rate would have been a good deal larger than it now is. The early anticipation of heart diseases is of great economic value.

There is an effort being made to show that infection is not the all-important cause of heart disease. True, it may not be; but it is so often the cause of heart disease, and we can so many times prove that it is, that we should continue along the lines on which we are now at work, and not be distracted from that line of thought without sufficient proof. In all tooth focal infection work we should determine, if we can, whether the area is a granuloma or a rarefied bone. If it is a granuloma, nature is making her supreme effort. If disturbing symptoms develop, it is evident that she is lacking in her immunizing effort. Extraction should be the rule.

Conclusions

1. There is a definite need of better diagnosis in focal infection work, as it is still an unsolved problem.

2. The resolution and cure of many

injuries is delayed on account of oral focal infection.

3. Many of the mistakes of the past in dealing with infection foci that arise in the mouth have been due to too much reliance upon the radiogram.

4. In forming pathological conclusions, every source at our command, including blood counts, microscopical examinations, clinical experience, and family immunity history, should be taken into consideration.

5. If it is a fact that metastasis in cases of cancer of the head and neck does not occur as readily as it does when cancer occurs below that point, we have a better opportunity in the cure of cancer by its removal than the general surgeon operating below the head and neck.

6. It is good practice to remove growths that may not be malignant but are beginning to show malignant tendencies, and the best treatment is their entire removal.

7. We are sometimes mistaken in non-malignant tumors, particularly those of a tuberculous nature.

8. Guarding patients against the occurrence of cancer by frequent examination after the patient is thirty years of age is good practice for the dental profession during the present cancer campaign.

9. When nature forms a granuloma she is making a supreme effort to hold in check infectious material until her immunity is established.

10. The patient's immunity against certain types of infection is a guide to the extent to which extraction should be practiced in that case.

11. In dealing with myocardiac disease as a result of oral infections we should endeavor to determine the approach of myocardial symptoms and remove infection foci early enough to prevent myocardial degeneration.

12. Infection outside the alveolar process may give rise to disease, and when Vincent's angina and amoeba are found in great numbers, together with the patient's lowered immunity against them, they belong in the realm of focal infections and should be dealt with accordingly.

13. Endocrine activity is an important factor in increasing local durability and immunity in the tissues supporting fixed bridgework when they are called upon to do more work than is expected of them when the full complement of teeth are in position; and the hormone mechanism referred to in this paper explains this resistance.

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A SERMON

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(Read before the Missouri State Dental Association, St. Louis, Missouri, April 16, 1923)

"BUILD thee more stately mansions, Oh my soul, as the swift seasons roll."—Oliver Wendell Holmes, "Chambered Nautilus."

Using the poet's license, Dr. Holmes probably idealized the "Chambered Nautilus" and conferred upon it characteristics which it may not possess, but inferentially the mollusk builds around its body a chamber or cell and as he grows larger and stronger, he builds another and more stately one, sealing up air-tight the one he vacates, and as time progresses he adds more cells and larger ones, sealing them air-tight as he leaves them for the statelier habitation, until he has air-tight compartments that buoy him up on the surface of the water. He then spreads a little membranous sail and in the bright sunlight or under the moon's pale beams, with the balmy breeze to propel him, he sails on the surface of the azure seas. Had he not builded well, the cells would fill with water, he would have sunk in the dark and fathomless depths and become jetsam on the slimy bottom of the sea amid its darkness, ooze and horrors.

The tale of the "Chambered Nautilus" may epitomize the life of every man. If he builds well, his character, his sense of justice, honor, generosity, kindness, and all his habits of mind and body, he, in the sunshine of love, esteem and confidence, propelled by the "Godspeed" and good wishes of loyal friends, sails high and dry, the wonderful rolling sea of life. And in proportion that he fails to so build, he sinks beneath the waves. Applying this to our lives we should give to each moment its quota of good service—the best we have to give—for this moment is all of life. The yesterdays are gone forever and tomorrows we know not of. We only live *now* and if we live well, if our activities are guided by honesty—man's sublimest attribute, by justice—the application of truth, by discernment—that distinguishes good from evil, by ethics—that govern human conduct, all tempered with kindness and gentleness, there will be no dread of tomorrow, nor regrets of yesterday and the world will profit by our short journey.

As the years fly past and pile up behind me, I am impressed more and more with the great importance of the commonplace things in our lives. It seems to me there are no big things at all, the apparent big things are but the culmination or accumulation of little things. The bee carries very little honey back to the hive from his excursion into the fields, but still there was almost a million pounds of honey exported from the United States last year.

We all know that if we "take care of the dimes, the dollars will take care of themselves" but we are inclined to

talk and think in thousands and even millions and toss the dime away as being of no consequence, while we know it may be the foundation of a fortune.

We know that the drab dominicker is more important to the development and maintenance of the human race than the bird of paradise, that the plow horse contributes more for world progress than the satin flanked thorobred, yet we hardly bestow a glance upon the hen, but bedeck our ladies' hats with the bird of paradise. We call the work horse a plug and give him scant attention, while we garland with high praise and even with roses the winner of the Derby.

We "glad hand" the successful promotor and speculator, whose absence from the midst of men would scarcely be noticed, but give scant praise or credit to him who represents the great profession of sustentation without which, our civilization would fall—the farmer.

How little we consider the air, without which our first faint cry would be our last. Fosdick says: "If we inquire what air is, the answer will probably be a formula stating that oxygen and nitrogen mixed in proportions of twenty-one to seventy-nine make air. But air in experience is not a formula. Air is the elixir we breath and live thereby. Air is the magician who takes the words our lips frame and bears them from friend to friend in daily converse. Air is the messenger who carries music to our ears and fragrance to our nostrils; it is the whisperer among the trees in June, and in March the wild dancer who shakes the bare branches for his castanets. Air is the giant who piles the surf against the rocky shore and nurse who fans the wan faces of the sick. One cannot put that into a formula."

We tramp upon the growing grass as we cross the meadows and consider it only food for cattle, but John J. Ingalls says: "Grass is the forgiveness of nature—her constant benediction. Fields trampled with battle, saturated with blood, torn with the rush of cannon, grow green again with grass and carnage is forgotten. Streets abandoned by traffic become grass-grown like rural lanes and are obliterated. Forests decay, harvests perish, flowers vanish, but grass is immortal. Beleaguered by the seven hosts of winter, it withdraws into the impregnable fortress of its subterranean vitality and emerges upon the first solicitation of spring. Sown by the winds, by wandering birds, propagated by the subtle horticulture of the elements which are its ministers and servants, it softens the nude outline of the world. Its tenacious fibers hold the earth in its place and prevent its soluble components from washing into the wasting sea. It invades the solitude of deserts, climbs the inaccessible slopes and forbidding pinnacles of mountains, modifies climates and determines the history, character and destiny of nations.

"Unobtrusive and patient, it has immortal vigor and aggression. Banished from the thoroughfare and the field, it bides its time to return, and when vigilance is relaxed, or the dynasty has perished, it silently resumes the throne from which it has been expelled, but which it never abdicates. It bears no blazonry bloom to charm the senses with fragrance and splendor, but its homely hue is more enchanting than the lily or the rose. It yields no fruit in earth or air, and yet should its harvest fail for a single year, famine would depopulate the world."

You all remember "Pinafore" and how one song goes:

"When I was a lad I served a term,
As office boy to an attorney's firm,
I cleaned the windows and I swept the floors,
And I polished up the handles of the big front doors.
And I polished up the handles so carefully,
That now I am the ruler of the Queen's Navy."

It seems a far cry from polishing up the handles of the big front door to an admiralcy in the English Navy, but it is the sanest and surest way to high accomplishment.

Of a man who attained the presidency of a big railroad it is said that his rapid promotions dated from the time he was observed by some officials, sweeping off the platform of a small station, where he was agent, and he swept off the platform so carefully that now he is the president. Not that the presidency is the prize of a sweeping contest, but it was a symbol of ethics, energy and interest in his work, and the officials were looking for men of that kind.

And in the practice of dentistry he who does good work in the so-called simple elemental service he is called upon to do will be promoted by his own ethics—energy and interest into larger and fuller service as the years pass.

All men in almost all vocations dream of the big things of life, and give little thought to the fact that there are no big things except as the result of paying strict attention to the little ones or the details of their activities. We look from where we stand—across the prairies and in the distance the grass is greener and heavier—we gaze upon the far hills and the woods are dense and enchanted simply because distance lends enchantment. The fishing looks better across the river for the same reason, we look for that most desired of humans, happiness, and think we find it in idle luxury, while probably it is a state of mind and is found in busy and active life—in performing the daily routine of duties to the best of our ability—and obtaining therefrom a reasonable reward from which by thrift and economy we may accumulate something for that sear and yellow time that, if we live long enough, comes to all.

We look upon the luxuries of the rich and envy them, failing to note that their faces and histories of their lives, do not always indicate happiness. Sorrow and misfortune visit them as it visits us and none may avoid it.

A successful man, materially, a poet, philosopher, dramatic critic, connoisseur of violins, etc., said: "I taught school twelve times in three states and nine districts—I curse the days wasted since my last term closed, forty-two years ago. Never have I been happier than when giving awakening minds, clues to the intellectual treasuries of the universe." He apparently felt that in teaching school he was giving something of value to others—something that would make them better citizens—the results of his work and of all those who pursue this very commonplace and most important of all learned professions—extends fan-like through the coming generations and its thoroughness is a measure of the progress of civilization.

The later years devoted to his own material success, this man felt to be wasted—an attitude quite rare, as usually one's ideas and ideals along such lines are modified or controlled by the environment of material success.

Some years ago while traveling through New England, I copied the following epitaph from a gravestone:

"Here lies the body of Dr. Elizur Hale late of Glastonbury, deceased, who departed this Life May 27 A. D. 1790 in the 66th year of his age, eight years from the time he graduated of New Haven college, having been a physician in said town, 22 years during which late period he applied himself with great assiduity to the study and practice of the healing art. A man of the strictest integrity, discharging the duties of his profession with ability and success in the practice (which was long) he shared universal applause. At his death all classes participated in the deepest mourning, lamenting the departure of their physician and friend.

THE SAGE IS GONE.

This modest stone what few vain marbles can
May truly say 'here lies an honest man—
Foe to loud praise and friend to learned ease,
Content with science in the vale of peace.
Calmly he looked on either like, and here
Saw nothing to regret, or there to fear.'
Let him accept these rites—a stone—a verse
'Tis all his children, all his friends can give."

Of whom can this be said except he that does his work well, patiently, carefully, charitably, and justly, and who will not concede that such a life is gloriously successful, and who is not inspired by this Epitaph to endeavor to leave such "footprints on the sand."

We have the opportunity to do so. We can comport ourselves so that those to whom we minister will be happier because we live and we will be happy in the knowledge of having done good work.

Our "opportunity" lies in developing the inspiration to do the best we can for every case presented and to believe there is "sublimity in simple honesty" and practice accordingly, and that honesty is not confined to monetary matters alone but looms much larger when applied to our conduct as a practitioner.

And when we bend every effort to live up to our ideals, making our patients' interest paramount, our personal interest secondary, good dental service becomes a routine practice, as good habits like bad ones, of mind or body, extend out into the future fan-like, ever widening as we go onward, "as the twig is bent the tree's inclined."

Some time ago there appeared an article in one of the popular Journals entitled "A Young Man's Career." I quote in part: What really counts in building a career is to do a rather small job first and get a reputation for doing it well. Now and then a genius—so called—seems to be able to jump the preliminary and intermediate stages, and at an early age occupy the seats of the mighty. But such is one in a million.

The foundation stone of a career is not so much the particular field or subject, as his willingness to master its technic and do small preliminary jobs well and loyally. If he can only realize that his youthful attributes, his superabundant energy and enthusiasm are given him for the very purpose of building the foundation, instead of immediately gilding the dome, he will already have won half the battle.

In curative and restorative dentistry there are more sins of commission than omission—in preventive dentistry, prophylaxis—there are more sins of omission. No dentist is doing greater work than he who applies the principle of prevention in his practice. No one does more worthy or important service for the public than he who thoroughly and efficiently cleans teeth and teaches his patient how to care for the mouth. It is no mean thing to do, either as a task or a service. It requires knowledge of the reasons for such service, a knowledge of the best methods of doing it, the procuring of suitable instruments and accessories for its accomplishment which are numerous and demand skill in their using, and who then takes infinite pains and ample time to achieve the deserved result.

There is a crying demand and need for such work—countless numbers of humans are suffering today with their teeth and the investing tissues, because they have not received such treatment and teaching. Every dentist who does such work has been told numerous times by his patients of their gratification, deploring the fact that they had not been so treated and taught earlier in life.

Girls and boys may, in many instances, be converted from slothful and neglectful habits to the most punctilious habits by such service, accompanied by advice and instruction, by teaching them

that the luster of the tooth is the mark of beauty, rather than for color or even arrangement, and appealing to their vanity, by telling them and usually with truth showing them how fine their teeth look with highly polished surfaces, surrounded and embellished by pink gums and red lips.

Another very commonplace and important duty is filling cavities in teeth, and we may state, the teeth of the young, in the best and simplest manner—and by the way, simplicity or leading the simple life is as desirable in the practice of dentistry as in any sphere. Knowledge of science and collateral sciences is fundamentally necessary for the fully equipped dentist, and without the findings and teachings of those who devote much time and effort to solve the problem of oral infection and the pathology of the teeth and investing tissues, we would be indeed a benighted branch of the healing art—but the necessity of much of this work might be eliminated by doing the elementary and commonplace work in a thorough and painstaking manner. Many ills of both mind and body such as smoking cigarettes or pyorrhea are very hard to cure when once well established, but might have been prevented with comparative ease if the proper care had been applied at the right time. When I speak of filling the teeth in the simplest manner I mean in the very best manner, with least destruction of sound tissue compatible with rational cavity preparation—not trying with large burs and stones, running 2,500 revolutions per minute, to save time but with small and sharp instruments (large ones if necessary,) trying to save the tooth and utilize time. Not following any formula or system of cavity preparation to the letter but rather in the spirit and doing all as gently and carefully and thoroughly as possible, then filling them well with whatever material is indicated for the case, leaving no overhanging ledges of filling material—polishing, especially the gingival border, and just in proportion as this is well done, not overlooking anything in the mouth that needs attention, will we render a good service and possibly prevent pulp trouble with the sequel of root surgery in the future, and in the words of Stephenson we may say, "I know what pleasure is, for I have done good work."

Another very common fault of the teeth is irregularity or malocclusion. It is a sacred obligation which we owe to the girls and boys who are placed in our charge dentally, to carefully observe any cases of this nature and most emphatically advise their correction if indicated. This work in cities of any considerable size is usually done by those specializing in orthodontia, but in smaller towns it must be done by the general practitioner or not at all. No one knows the value of beauty—normality—harmonious features—and many boys and girls might have the whole course of their lives changed for the worse because of our apathy or for the better because of our activity in their behalf.

We may fill root-canals without the sequel of inflammation, granuloma, apicoectomy, and extraction; we may make dentures so the uppers stay up and the lowers stay down, and make partial dentures that will not rapidly develop into full ones and make bridges that are as useful and sanitary as a wooden leg; but, while these things must be done, we should not let them overshadow the more important work of attempting to prevent them, by doing good work in earlier years.

We must not exaggerate the importance of nerve blocking nor underrate the importance of sharp burs and excavators,

nor permit the esthetic charm of the porcelain jacket crown to blind us to the excellence of an amalgam filling nor let a great array of shining instruments in velvet-lined trays alienate our regard for the forceps, nor should we let the cast gold inlay deprive our patients of the great benefits of the gold foil filling.—Van Woert.

Mark Twain in answer to a severe criticism by Andrew Lang, English critic, of his "A Connecticut Yankee in King Arthur's Court" said in effect that he was writing for a much larger audience than critics, that he was writing for the common people, those who needed and appreciated his philosophies. That he felt that writing to suit critics was like feeding the already overfed. The critics felt that music was to be found only in the grand operas, which a very few could ever hear or appreciate, while countless thousands were entertained and made happy by the hurdy-gurdy and the folk songs; that Venus or the Apollo were the only things worth while in sculpture while the plaster cast has embellished and added charm to the homes of innumerable who would never know the work of the great masters, that Homer was the only poet while millions enjoyed Carlton and Kipling who would never read Homer. Along the same line of reasoning, is it not true that the dentist who cleans teeth, or fills them and extracts them when necessary and constructs plates and dentures to restore them, for the great mass of people who cannot have prophylaxis root-canal surgery, apicoectomy-surgical removal and Chayes bridgework, is after all doing the greatest good to the greatest number.

Of course there are those among us who cater to the critics, especially in large cities, who make dentures of such size and luster that they can be used as mirrors and save carrying a vanity case if they can't be worn in the mouth, or who feel that they won't be in style if the three quarter crowns don't have perfect lines with a perfectly square shoulder and a good belt in the back, or those who perform painless dental operations, which may be accomplished by inserting into the sensitive tissue and attractive looking needle about three inches long, and, gently leaning on the plunger, inject into the nerve trunk or some of the branches thereof, a lethal fluid, that makes extracting an ecstasy, curetting a caress and paying a pleasure.

But while these men are feeding the overfed, and satisfying them, we who practice in the smaller cities and towns must feed the hungry and satisfy them also.

Solomon says: "Where there is no vision the people perish," and that we may not perish, let us have the vision of moments and hours and days well spent, of work well done, of cleanliness, of honesty, of worthiness and understanding, of health and comfort conserved in the mouths of those to whom we minister, of the great importance of the commonplace in our activities. Let us "build more stately mansions as the swift seasons roll."

WHAT WILL YOU DO IN PRACTICE?[1]

By VICTOR RYHN

UPON the completion of a certain operation or diagnosis, the dental student often turns to his instructor and says: "But, Doctor, how would you treat this case in your own practice?" To the student who is completing his college course in dentistry a private practice is something mysterious. The thought of soon being left alone to make his own diagnosis, outline his treatments, and perform his operations without any supervision, naturally excites his curiosity. He cannot help but feel his incompetence in many aspects of the work, but at the same time he has an intense craving to try out what he has learned in his years of training. All through his course he has dreamed of that little office which will some day be his to do as he pleases in, that artistically arranged reception room in which he will greet his patients, that operating room with its odor of eugenol is to be the very essence of neatness and precision, and that not too orderly laboratory where he can perform his experiments in his spare moments which he has always longed to do. It has been well for him to dream of these things, but now he has shaped them into more definite working plans. The technicalities of his profession, and his nearness to graduation have abolished many of them and they are replaced by barren practicability. He will always have his dreams, but as he progresses they will become loftier and more noble. Already he has determined that in order to obtain the most happiness from the practice of his profession his greatest aim must be service to suffering humanity. He knows the guilty feeling that accompanies the "points" in his little book on work that was not as it should have been. He is going out to conduct his practice in such a manner as to repay the state, and reflect credit upon his college and its faculty which has labored for the sole purpose of making him the best dentist they know how. But what will you do in practice?

His first problem is selecting his location. Is it to be in the city or in the country? His four years of intimate relationship with the city has made this decision a real problem. He has learned to love the city with its vastness, its busy atmosphere, its fine office buildings, theatres, hotels, and what not. He was happy in his home town while he was growing up, but his education has made him demand something better. In the city he will have much competition and for a long time his income will be small. However, he will belong to the city dental society, and so will be able to better his knowledge of the profession through association with other dentists of greater experience than his own. In the country town his competition is less keen, his

[1]Thesis, College of Dentistry, University of Minnesota, Minneapolis, Minnesota.

overhead expense is much less, and so his financial gain is no doubt greater in the beginning. It is not long, though, before he realizes that his practice is limited because of the population, and then he wishes that he had located in a larger town or city. If he moves it is again a struggle to establish himself in the new community. True, he has gained experience, but it has been his own and so has not been guided by wiser men than himself.

After he has made the wisest decision he knows how in the matter of location he must begin to set his house in order and establish himself in the community. In the matter of office equipment too much cannot be said about the proper selection. He should have the least equipment with which he can do his work in the quickest and easiest and, therefore, the most efficient manner. It should be neat and practical so as to create a pleasing impression upon his patients. He should not allow himself to be "sold" by the representatives of dental supply houses. To the man of limited finances loading himself down with expensive equipment has often spelled failure from the start. He cannot expect to do good work when his mind is continually centered on how he is going to meet his large payments. He should now call upon the best bankers in his community and establish his credit. The banker will help him to obtain financial information about his patients. Announcements of his opening may be mailed to as many people as he desires. This should merely contain his name and address etc., and should not give the impression of an advertisement. Advertising is distasteful to the profession and so must be guarded against on every hand.

He is now ready to receive his first patient, and his treatment of this one as well as of all succeeding ones constitutes the most important phase of his practice. Unfortunate he is if the patient comes in unawares and finds him lopping around the office with nothing to do but read or smoke. He must give the impression that his mind is centered on his profession whether it is or not. There are hundreds of things which he might be doing in his laboratory which will not only occupy his mind but also improve it. The patient finally seated in the operating chair, the dentist should lend an attentive ear to the complaint. There is one certain thing which has brought the patient to the dentist and as that is the most important thing in the patient's mind for the moment, she should be allowed to talk about it. The dentist should give her that comforting feeling that he is vitally interested in her well-being and that he will do all in his power to relieve her complaint. After he has satisfied her as to the diagnosis and treatment, he should begin a thorough examination of the oral cavity and report his findings to the patient without exaggeration. The chances are that they are bad enough already without elaborating them. The importance of this thorough examination has been drilled into him time and time again and yet if he is not careful he will soon find himself in the channels of so many practitioners who look into mouths day after day and see nothing but teeth, teeth, teeth. He should then remember that the first thing to notice, on opening the mouth, is the condition of the mucous membranes. Without healthy membranes to begin with it is useless to go any farther in the building up of a healthy mouth. He is also aware of the frequency of neoplastic growths in the mouth. The discovery of these in their early stage by the dentist may save the life of the patient. Pyorrhea alveolaris, that dreaded disease, which to the layman is in the same class

with leprosy, starting as a simple gingivitis which so frequently is allowed to pass unnoticed by the dentist. He goes ahead and puts expensive restorations in a mouth, and a few years later the teeth must be extracted because of pyorrhea. Is it any wonder that the public has so little faith in dentistry? That slightly inflamed border around the gingiva can so easily be checked by prophylaxis and home care, but the dentist continually neglects to bring it to the patient's mind. That is what makes dentistry a profession, instructing the people in the care of their mouths in order to preserve their health. A sound mouth, a healthy body. After the membranes have been taken care of, the missing teeth should be noted. This is very important in planning out the restorative work which will later be done. He should now begin an examination of restorative work already present in the mouth. This should be done with the idea of detecting leaky margins, overhanging margins at the gingival, ill-fitting crowns, loose or broken fillings or bridges. In case of full shell crowns or other large restorations it is usually desirable to obtain radiographs to assist in determining the condition of the root and surrounding tissues. Now he must solve in his own mind the long-debated question: Shall devitalized teeth be extracted? True, the lowered vitality at the apex provides an excellent media for the growth of streptococci. This is what usually takes place and large abscesses are found which usually become walled off by connective tissue and constitute the root granuloma. Now the patient complains of heart trouble or rheumatism in certain joints. The suspicious teeth are extracted and in a short time the trouble clears up. On the other hand the same conditions may be present, the teeth are extracted and the trouble remains unchanged. It has actually been found that some of these dark areas about the apices are absolutely sterile. Therefore, he must be very careful about information he gives his patients regarding the prognosis of certain diseases. If the patient is well and strong and complains of nothing besides his dental condition it is well to be lenient with these dark areas. However, if there is some positive physical ailment then it is well worth the sacrifice to take the chance. In doubtful cases like these he should present the patient with all the facts and after advising a certain treatment, should allow the patient the privilege of rejecting it if she so desires. It is not well in such cases to force anything down the patient's throat. As one man stated, "In any event keep your nose clean." He may now proceed to check up on the teeth affected with caries. The restoration of affected teeth with operative dentistry will be sufficient to tax his ingenuity and skill to the limit. Where should he use amalgam and where should he use gold? The amalgam work in dentistry has been greatly abused in the past years. Because it is composed of cheaper metals than gold is no reason why the work should be cheaply done. A dentist's only commodity is time and so his fees should not be influenced very much by the kind of material he uses as far as their initial value is concerned. If the mouth presents dental arches which are irregular in alignment or in which a number of teeth are missing, casts should be made in order to check up the malocclusion. This should be done before any restorative work is started, because in the correction of malocclusion the bite may be changed. Malocclusion and traumatic occlusion have come to be recognized as one of the chief causes of pyorrhea alveolaris. This comes about by a battering of one tooth by an opposite tooth to such an extent that the

surrounding tissues become irritated and provide a place for the lodgment of bacteria. This may often be corrected by grinding down the affected teeth so as to relieve them from undue stress. The casts which have been taken are useful in making a thorough study of the occlusion and the abutments before commencing any crown and bridgework. He should have a suitable chart on which to record all his findings, and then he will be in a better position to convince the patient of work which should be done. In no case, however, should he attempt any work in which he is reasonably sure he can not obtain a favorable result.

He is now confronted with the matter of fees. All through his course he has been told that if he has embarked upon the profession of dentistry for the sole purpose of financial gain he is certain to be a failure as a dentist. Theoretically, if his work is worthy he will be rewarded, but this does not imply really that he shall neglect his remuneration. Fees serve a dual purpose; they force the dentist to do better work in order to obtain larger returns, and they make the patient appreciate more the value of good dentistry. Nothing is worth having that comes without an effort, and so if the work is satisfactory the patient will appreciate it more if she has paid a good fee for it. The dentist has many expenses and so must have enough to meet them and also provide for the times when his efforts will not be so fruitful. The larger his fee the more time he can spend on a piece of work, and therefore, the more perfect will be the result. Small fees always denote cheap work so a dentist is rated partly by the fee he receives on a piece of work. He does not have to place an excessive fee on a piece of work, but it should be in proportion to the amount of time he spends upon it. As soon as the fee has been decided upon the patient should be requested to commence payment of it so that it will be completed by the time the work is finished. This usually creates a better feeling between the dentist and patient, because they both will take a keener interest in the work.

At all times the dentist must endeavor to better his profession by commanding the respect of the public. This he can do by observing proper conduct in his office, by his reputation in the community, and by the code of ethics which he lives up to. The public in general is still inclined to look upon dentistry as any one of the mechanical trades. In his office he can do much to change this view to one of respect the same as the medical profession enjoys. He must show his patients that he is interested in their health beyond the mouth. They will be interested in learning just how their teeth may affect their whole physical well-being. He should bring out the fact that diet plays a large part in preserving the health of their mouths as well as the rest of their bodies. He should teach these things with such sincerity that his patients will respect him for his knowledge. At all times must he preserve his dignity while in the office, and convince his patients that he is master of the situation no matter what it is. In the community his presence should be felt through his activity in the affairs. This does not include politics, however, and he will be wise if he does not take sides too strongly with any certain clique. The public schools will offer him a great opportunity to spread his gospel, and he should take advantage of this to improve the health of his community. He should associate himself with a hospital as he will be able to do much good there, and at the same time increase his knowledge along medical

lines. If he sees fit he may also offer his services to charitable organizations, and he will find that the public will soon learn to respect him and his profession. His code of ethics must be in accordance with those adopted by his state society. This will include his refraining from any kind of advertising. It should be his aim to do his work in such a manner that the patients will provide all the advertising he needs. The other kind puts him in the same class with a tradesman. He must not collect fees for work which he has not done himself such as radiographic work and orthodontia appliances. Entering into contracts with specialists and receiving commissions on work which he may send them places him in an exceedingly bad light with other members of the profession. He should at all times keep abreast with the profession or be at once classed as old-fashioned. The various dental societies, as the national, state, and district, will give him an opportunity to see what other men are doing and so make his own work easier for himself. The periodicals will also assist him in doing this and he should subscribe to them and read them religiously. Lastly, just as soon as it is possible for him to do so he should get married. There are those who will say that this serves only to kill his ambition for the betterment of the profession. On the contrary a home, with someone else to care for than just himself, will broaden his outlook on life and humanity and will help him to do greater things professionally. It is wisely said that the more a man has to do the more he can do. It will serve to mellow his life with its comradeship, its music, books, and wholesome living conditions.

But what will you do in practice? When he encounters the hardships of a practice will he say, "What's the use," and so condemn himself to become a mediocre practitioner, or will he remember his cherished dreams when he was a student and take renewed heart and carry on in order the he may leave the profession with the comforting feeling that he has really done something to better it. When he starts out with his diploma under his arm he carries with him a certificate to everlasting happiness if he will but make use of it, for he is equipped for the privilege of administering a helping hand to the betterment of humanity and there can be no greater happiness in the world than this. And furthermore, as Kipling says:

If you can talk with crowds and keep your virtue
Or talk with k'ngs nor lose the common touch
If neither foes nor loving friends can hurt you
If all men count with you but none too much
If you can fill the unforgiving minute
With sixty seconds of distant run
Yours is the earth and all that's in it
And which is more you'll be a MAN my son.

and incidentally a better dentist.

A WIDER INTEREST IN INDUSTRIAL DENTISTRY

By HENRY L. BANZHAF, B.S., D.D.S., F.A.C.D., Milwaukee, Wisconsin

(Read before the American Dental Association, Cleveland, Ohio, September 10-14, 1923)

THE small group of dentists of today interested in industrial dentistry are still pioneers. Their work has been given the stamp of approval by only a small fraction of the owners of industries and likewise by only a small fraction of the dental profession. The truth of the matter is that, generally speaking, the movement to give dental service to the employees of the industries in an organized and special way has not yet attracted nation-wide public attention.

In this discussion, it seems fair to take it for granted that in a general way, at least, we all recognize the great benefits to the workers of properly conducted industrial dental clinics. Therefore, I shall not argue this point extensively, since it seems to be a proven fact that these clinics, few as they are at present, are of great benefit to both employee and employer. For these reasons, I shall confine my discussion to a consideration of the scope of the industrial work that should be attempted, together with some observations as to the best means to secure a wider interest in this important work.

The industrial dental clinics of the past and of the present day were, in many cases, originally established for one or both of these reasons: Medical and dental services were used as a bait along with other welfare work to attract employees and hold them in the employ of the corporation. Either this or industrial service was instituted because it was considered to be a good financial investment for employers of labor, because the employee's time was conserved. The industrial dental clinic for the future, however, will not be maintained so much for these two reasons as it will for a third; namely, a real interest that the employer will take, either voluntarily or otherwise, in the welfare of his employees.

The last one hundred years of our civilization have been spent perfecting the inanimate machine; the next hundred years will be spent in perfecting the human machine. The employer who gives no attention to the mental and physical welfare of his employees in the future will inevitably fall behind in the race. Unless he, personally, assumes a wise and friendly leadership of his employees by convincing them that he is a golden rule employer, and thereby gains their confidence without being obnoxiously paternalistic in his attitude, this leadership will continue to be assumed by the labor leader and the radical political demagogue.

The idea of the industrial dental clinic, therefore, is bound to grow. The movement, however, must be seriously considered and wisely directed, because it is not entirely free from danger that may

prove to be one of the agencies capable of bringing harm to our entire social structure. In fact, I am convinced that this is one of the reasons why the clinic idea has not received more generous support from both the employers of labor and the profession at large.

The information received from a questionnaire recently sent out to the dentists in charge of industrial clinics of some of the largest corporations in the country shows that there is a great difference of opinion as to how these clinics should be conducted.

All agree that the industrial clinic is popular with the majority of the employees, as well as indirectly profitable for the employer. One or two of the replies indicate some doubt as to the popularity of the clinic with the employees; only one expresses a shade of doubt that the employers regard the clinic as an excellent financial investment. The most important differences of opinion among the directors of these clinics may be summarized under three headings:

1. Some conduct the clinic indirectly through an employees' mutual benefit association; others are conducted by the company directly.

2. Some believe that the work should be restricted to first aid work, such as simple extractions, the alleviation of pain, mouth examination, and prophylaxis; others, that the operative and prosthetic work should also be done.

3. Some believe that a fee should be charged for the work; others, that the work should be free. In all cases where more than first-aid work, mouth examination, and prophylaxis were given, fees were charged.

It may prove interesting to discuss these differences of opinion. Should a corporation give free medical or dental treatment of any kind to its employees, with the possible exception of first-aid work, the relief of pain, and educational prophylactic work? In my opinion it should not. Practically all American workingmen today can afford to pay for dental services; therefore they should be given the privilege of doing so.

Free dental service, and by this I mean free operative and prosthetic work, has a demoralizing effect on the recipient. Either it pauperizes him mentally, or he has the suspicion that the cost of the service is subtracted from the wages that he and his fellow employees would otherwise receive. It makes him dependent on his employer for services that are essentially personal, a condition that is obnoxious to the average worker. With respect to dental service, the employee can have the right mental attitude toward his employer and his work only when he is paid sufficient wages to enable him to buy his own dentistry. Free dental service given by the industries to their employees, other than educational, prophylactic and emergency work, is but a step removed from free dental service by a state, which, in my opinion, is a menace to our democratic form of government.

With a little wise direction on the part of the employer, however, the employees can buy dental service for themselves through the information of an employees' mutual benefit association. Such an association should not merely give medical and dental services, but should also be organized on the plan of a building and loan association which would assist the members to own their own homes, to save their money, and to invest it wisely. A third function of such an association would be social. The Milwaukee Electric Railway and Light Company has an ideal employees' association of this kind. A happier, more contented group of employees would be hard to find. Their outstanding char-

acteristic is loyalty to their employers. They need and desire no labor union. There have been no labor disturbances for over twenty-five years. In fact, approximately 50 per cent of the employees have interested themselves in the electric company financially through the purchase of bonds and preferred stock.

The dentists and hygienists employed by such an employees' association should be well paid and capable. The staff should not be constantly changing. The service, if possible, should extend to the immediate members of the families of the employees. Every employee should think of the clinic dentists as "our dentists"—not the "corporation dentists." No employee should be taught to expect to get anything for nothing. This brings us to the second and third differences of opinion just mentioned; namely, the scope of the work and the fees. Every employee should be entitled to emergency work, such as the relief of pain and to three or more prophylactic treatments and examinations a year, at the expense of the association. Further, he should be entitled to receive operative and prosthetic attention at fees set by the association. Contracts for the work of orthodontists and other specialists not included in the clinic organization may be let for the individual employee by the dentist in charge of the clinic, who would be more competent to pass on the work done by the specialist than would be the individual employee.

Of course, in an employees' benefit association of this kind, the dental clinic would be merely one of a number of services offered. The corporation could afford to support the association liberally by lending it the necessary funds for its organization, because one of the greatest assets for any business is a happy and contented body of workmen and freedom from labor disputes. I do not believe, however, that the corporation should appropriate funds of more than a nominal amount for the maintenance of the association. Rather, it should pay the employees well enough so that they can afford to pay for the service they receive.

If for some reason an employees' association is not possible or feasible, dental service should be given by the employer; but this service never should consist of anything more than educational, prophylactic or emergency work. I do not wish to belittle or disparage a clinic of this character, because this is the only kind of dental clinic that can be organized in most industrial establishments; but I merely desire to point out that a clinic conducted by the employees under the leadership of the employers is far more preferable, and will yield better results.

This, briefly, is my idea of how the employees of large industries may be induced to interest themselves in dentistry for themselves and their families.

How to reach the employees of smaller industries is a much more difficult problem, because an industry employing but ten or fifteen, or even a hundred men could not expect to have an employees' association that could maintain a clinic. This is a problem that is much harder to solve. It does not seem fair to limit industrial dentistry to the employees of large corporations alone. In a paper read before the American Dental Association in 1921[1], I described what I believe to be a type of industrial dental clinic that will solve this problem. A clinic of this type was organized in Milwaukee. I shall not here again go into the difficulties that were encountered by this clinic. I have enumerated them in the paper referred to. Suffice it to say that

[1]Banzhaf, *Journal of the National Dental Association*, November, 1921, p. 901.

these difficulties, together with a disastrous fire, were sufficient to cause the men in charge to think of abandoning the experiment. Employers in general were not yet sufficiently interested in the welfare of their employees to take an active interest in the work. The industrial depression after the war also was an unforeseen condition. An industrial dental clinic such as the one that was attempted in Milwaukee will undoubtedly meet with much less discouragement in the future when employers will, *voluntarily or otherwise,* be more receptive to the idea and when the public will have become more educated to the need for dentistry. Clinics of this character, in my opinion, will be numerous in ten years from now.

In passing, let me remark that an essential for the success of such a clinic is sufficient funds to place it on a sound financial basis, and strong executive control. Some one person must assume all the responsibility. Some one person must represent the clinic with the employers who are interested. Unless this executive is a business man as well as a dentist, the clinic will fail.

The industrial dental clinic is a permanent institution. It is not enough to educate the child to the need for dentistry. The lessons that are taught to the child are soon forgotten, unless dentistry is made easily accessible and kept constantly before the people. Good dental service must be given at prices that the average worker can afford to pay. The dental clinic fills this need. Not only will the industrial clinic benefit the public, but it will benefit the dental profession, because it will increase the demand for dentistry.

It has been charged that the industrial clinic is a step toward state dentistry as a part of a general socialistic program. From a financial point of view, this part of the socialistic program should not alarm the dental profession. In fact, state dentistry from a selfish point of view would undoubtedly benefit the great mass of dentists because there would be a lively competition on the part of the state authorities for the services of the members of the dental profession, a profession that is not large enough to cope with the present situation, let alone a situation which would increase the number of patients who would call for dental services by several tens of millions of people. From the point of view of good citizenship and patriotic love of country, and proper development of the people, however, the members of the dental profession should, in my opinion, discourage such an arrangement.

The question how far the state should go in legislation affecting the health of the people is an interesting one, especially in these days of paternalistic tendencies, particularly on the part of politicians at election time. As I see it, the state not only has a right to enforce but a duty to protect through laws the health of its citizens. But that duty and right must never over-ride the right of the individual.

The state, no doubt, is within its rights to prescribe dental care by legislation, but it is unsound to claim that any state can demand that its own employed dentists, or specified ones among private practitioners, do the dental work required in general or in particular. As a health measure, however, it is the right and duty of the state to pay more attention to the education of the public with respect to the care of the teeth, leaving private agencies to administer to the needs and wants of the people in that regard.

The widespread organization of industrial clinics of the proper kind, both medical and dental, will have just the op-

posite effect charged by their opponents; because, if they provide proper dental services at a minimum cost, there will be no widespread demand for state medicine and state dentistry. Otto P. Geier, of the Cincinnati Milling Machine Company, summarizes this idea as follows: "Medical or dental service by industry is, on the contrary, the development of private initiative and responsibility toward medical and dental problems, and to that extent disapproves the consideration of state interference. Unless industry and society improve medical and dental service for the average man, the state will have to attempt to do the job with a resultant high cost later."

It seems to me that those of us who are interested in industrial clinics have an immediate duty to perform. First, it is necessary to interest employers in the welfare of their employees, and sell this idea. Employers must be educated; they must be made receptive to the idea of helping to give proper health service. This presents an interesting problem in advertising. It cannot be done on as broad a scale as the advertising campaigns that dental societies should be, but unfortunately are not, prosecuting in order to interest the general public in dentistry. Newspaper broadsides, motion pictures, and other advertising methods should be used by dental societies. Of course, I am well aware that there is, generally speaking, a deep-seated objection to this in the average professional mind. But frankly, one may surely ask: Why not advertise the truth about health in a proper way? Is there any earthly reason why the dental profession should not be as up to date in its publicity methods as is any other worthy activity? If a clean mouth is necessary for a healthy body, it is worth while to tell the public about it in an emphatic way. The advertising field should not be occupied solely by the dentist who sells gold and silver and five-dollar crowns. It is an encouraging sign to see that in the July, 1923, issue, the editor of *Oral Hygiene* goes so far as to suggest that a "Dental Welfare Week" be set aside, during which time the dental profession should impress on the nation the value and necessity of good dentistry. We need ideas of this kind, although I question whether a "Dental Week" program is the best means to employ. There are too many different kinds of "Weeks" being pressed down on the public already. Business men are getting tired of them and they have lost their glamor for the patient public in most communities. We have been "Weeked to death" in the past year, especially. It is time that we have a "Nothing Special at All Week" for a change. The "Week" has lost its pulling power. It was great while it lasted, but it was worked to such an extent that it, like the average drive, has become an undeniable liability rather than an asset.

It is obvious that any general publicity campaign by industrial dental clinics to interest the owners of industries would not be practical because it would be too costly a way to reach so relatively small a group. One good way to reach the employers is through such business men's clubs as the Rotary, Kiwanis, or Lions Clubs, or through such bodies as associations of commerce. Any dentist holding a membership in one of these valuable organizations has an important responsibility and a great opportunity to benefit his own profession as well as the public. The publicity that such a dentist can give to the industrial clinic idea, as well as to the public school clinic and other worthy movements that tend to educate the public on the value

of dental service in relation to general health, is indeed very great.

Perhaps the best medium through which we may work in order to secure publicity for the industrial dental clinic with the owners of industrial establishments is the Association of Commerce, known in some cities as the Chamber of Commerce. It is true that there are comparatively few in our profession who are interested in such organizations to the extent that they are members of them. And it is equally true that not all such associations or chambers of commerce are sufficiently progressive to realize the importance of such work on their part to both the health and industries of their communities. But there are many men in these organizations who, if properly approached, will endeavor to secure the much needed cooperation from this all important agency. Associations of commerce are still an experiment. They have done much good and little harm. They have, however, in most instances, not yet found themselves so far as the people as a whole are concerned. This is largely due to their having cut too closely in the past to strictly business lines of demarcation in their activities. They must be civic as well as commercial or industrial, if they would endure. And in the discharge of their duty, they must make health a prime factor of their interest in the people of their city. The health of a city is as valuable an asset as its banks, factories, stores, schools and other institutions. Without health, a productive, prosperous city is not possible. The dental profession and all civic organizations have a common ground of services to their respective communities. If these organizations are modern and progressive, it will need but little persuasion to induce them to take up the cudgel of education so badly needed in dental matters among the rank and file of our citizens.

Any suggestions concerning industrial dental work coming from or through the association or chamber of commerce will have much weight because it is presumed to be the clearing house for commercial as well as civic activities, and be free from all selfish motive. The proper committee in any of these organizations I have mentioned should make a study of the best method to be employed in its respective community to attain the best results, and then proceed to formulate a health program not for a week, but covering a year or several years.

It is also immediately necessary, however, to sell the dental profession on the idea of the industrial clinic. Too many dentists oppose the movement. That, to my mind, is the greatest present obstacle. The reason for this is lack of understanding of the true function of the industrial dental clinic, and fear that the dentist with a private practice will suffer. A good many dentists still insist that the profession is overcrowded. Statistics mean nothing to them. They know from personal experience that their own practice is far from lucrative, and assign overcompetition as a reason. Of course, in this as in every other line of business or professional endeavor, 90 per cent of the failures in life assign the same reason. A friend of mine in the dental supply business, who knows dentists and their shortcomings better than we do ourselves, was recently asked by one of the members of the graduating class of 1923, of the college with which I am connected, whether it would be better, from a financial point of view, to establish a practice in a city of 30,000 inhabitants where there were fifty-five dentists, or a village of 1,200, where there never had been a dentist. His reply was: "The fact that there are fifty-five dentists in a town of 30,000 shows that there is a lot of dentistry done there. That is the place I would advise

you to locate in to begin the practice of dentistry, if your aim is to make an immediate financial success." I venture to say, however, that if you were to interview each of the fifty-five dentists, at least half of them would tell you that there were too many dentists in the town already. These men are the type that would undoubtedly not favor the establishment of industrial clinics. They do not see that the industrial clinic, because of its educational influence, would increase the number of their patients, and that it, for the same reason, would decrease the number of patients that find their way into the offices of the cheap, advertising quack.

Perhaps nothing can be done at present to convince more than a small percentage of these men that by refusing to support the industrial clinic idea they are not only retarding the progress of good dentistry but are also injuring themselves as well.

As a remedy, I would suggest that dental schools become interested in this problem as an obligation they owe to society, and that instruction be given to dental students on the way a properly conducted industrial dental clinic should function, so that future graduates will know something of the tremendous importance of the movement. If the dental school is located in the vicinity of an industrial clinic, the students should be required to visit it and study it at first hand. If a cooperative system of training can be established between dental schools and industrial dental clinics, the advantage derived will be mutual, and the people will be the chief gainers. It is becoming cumulatively obvious that the product of our dental schools is improving from year to year. Higher requirements, better teachers, and increased facilities and equipment are creating a type of professional man who is awake to the possibilities of the dental profession by giving better health service. Many of the slumberers who have never sensed the tremendous importance and value of their vocation in life and its vital importance to mankind are past recall and may remain forever asleep. This will probably always be so, not only in dentistry but in all the various activities of life, but this need not discourage anybody.

Our hope for support of the industrial clinic idea must, therefore, lie in the dental schools, in the ranks of the earnest, progressive dentists, and the best type of young manhood entering the profession.

Reach the people through instruction of the pupils in the schools, through giving lectures before societies, city clubs, through industrial clinics, through other ethical, educational and advertising means, and you will build up confidence in the profession. The small groups of dentists now engaged in these valuable activities comprise probably less than one-half of 1 per cent of the profession. These groups must be reinforced by the addition of more energetic, capable dentists and dental hygienists, because the task of education is undoubtedly the most important task confronting the dental profession during the next decade.

THREE PROOFS OF THE ORGANIC NATURE OF THE MATRIX OF HUMAN ADULT ENAMEL

By CHARLES F. BODECKER, D.D.S., New York City, New York

(Read before the American Dental Association, Cleveland, Ohio, September 10-14, 1923)

THE chemical nature of the enamel of the teeth has been much discussed, and yet very little practical research work has been done on this subject. The analysis quoted by most textbooks on dental histology is that of Van Bibra, published in 1844. If we consider the progress made in micro-analysis, a proceeding unknown at that time, it is surprising that Van Bibra's analysis has not long been checked up.

Pickerill has claimed that the density of enamel varies, and that the so-called hard and soft teeth (sclerotic and malacotic), so long observed by the clinician and so long denied by the histologist, do really exist. It is therefore high time that a series of new analyses be made and not of enamel taken promiscuously, but of enamel of teeth having complete clinical data. Analyses should be made of enamel that has resisted caries and such as has been prone to decay. In this manner, I am certain, surprising data will be obtained on the variability of the chemical composition of this structure. This opinion is not based on mere guesswork, but on experience gathered from the preparation of many microscopic specimen noting the radical difference of hardness of the various kinds of enamel.

My celloidin decalcifying method, when applied to the enamel of human, adult teeth, furnishes a matrix which I claim is organic in nature. A section of this residue shows the interprismatic substance surrounding spaces previously filled by the enamel rods or prisms which have been almost completely dissolved by the action of the decalcifying agent, the prisms being almost entirely inorganic in nature. These specimen definitely prove that the enamel rod is of a different chemical composition than the interprismatic or cement substance.

Tomes claims that the enamel contains no organic matter whatever. He compares the enamel prisms to a bundle of glass rods and the interprismatic substance of the enamel to a glass of lower fusing point, melted and poured into the spaces left between the rods. The simile is undoubtedly apt, yet, to my mind, conditions would be more truly demonstrated by representing the interprismatic substance with Canada balsam, which also has the same refractive index as the glass rods, yet is of an entirely different chemical nature. If this experiment were carried out, we would obtain a solid block, with an almost uniform refractive index, but, on analysis, would find that the glass rods and the inter-rod substance react differently to solvents, for the two substances, glass and

Canada balsam, are chemically different. This rough comparison represents to my mind more nearly the prevailing conditions in the enamel.

The point on which I wish to lay particular emphasis is that the residue obtained by the celloidin decalcifying method is organic, contrary to the views of others, who claim that this matrix is a form of inorganic matter. In support of my claim, I advance the three following tests, two of which would, even singly, be considered sufficient proof to definitely settle this controversy. They are (1) decalcification; (2) xanthoproteic test for organic matter, and (3) incineration.

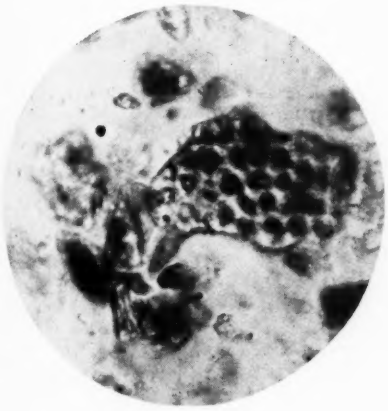

Fig. 1

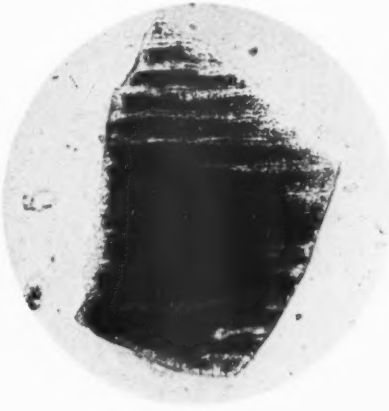

Fig. 2

1. Decalcification. The action of acids dissolving inorganic matter and leaving the organic matrix is known. When a chip of human enamel is exposed to acid, it apparently disappears, leaving only a slight sediment on the bottom of the receptacle. This sediment represents the organic constituent of the enamel, which is, however, so delicate and so finely distributed that it is quickly torn asunder and sinks to the bottom as an almost impalpable and hardly discernible powder when the mineral constituent is removed by acid. The celloidin decalcifying method, when used to prepare specimen of enamel, preserves this matrix in its approximate shape. There is no doubt whatever that it is resistant to acid to which it has been subjected for weeks. It has not the hardness of a mineral body, but is soft, for it can be sectioned to a thinness of 3/25,000 of an inch (3 microns). These qualities, which appear to be inherent in organic matter, are, however, not sufficient proof to establish irrefutably the chemical nature of this residue; therefore, in 1907, I applied the xanthoproteic reaction.

2. Xanthoproteic reaction. This reaction is a test for the presence of matter belonging to the benzin ring, which appears solely in organic matter. The test is therefore regarded as final proof of the presence of organic matter, being a standard reaction for this purpose. The substance to be tested is first sub-

jected to the action of nitric acid and then to caustic potash or some other alkali. If the specimen thus treated turns yellow, it is organic in nature. The matrix of the enamel of human adult teeth, obtained by the celloidin decalcifying method, has been subjected to this test, causing it to be stained a decidedly yellow. The result of this test, which is, as before mentioned, a standard reaction for organic matter, definitely proves that the enamel prism sheaths, as well as my enamel lamellae and Williams' enamel whorls, are organic in nature.

Recently, I have been able to add a third method of proving the chemical nature of the interprismatic substance of the enamel, a method that allows of no possible false interpretation, and one, the results of which can be shown on the screen. That is incineration.

3. Incineration. Organic and inorganic matter always show the same reaction toward heat, no matter how intricate their combination may be. Organic matter will burn and be destroyed; mineral matter will not. Specimen of human adult enamel were subjected to a heat of 800°C. The residue was enclosed in Canada balsam and photographed by J. Leon Williams. Figure 1 is particularly instructive, as it shows the tissue in cross section. The body of each prism is seen completely preserved, while the interprismatic substance has disappeared. The organic matter constituting this part of the enamel has been burnt out.

After examining specimen of incinerated enamel in cross section, the photographs of longitudinal sections of this tissue become quite clear. Figure 2 shows such a photomicrograph in which the alternate bands of wider, granular and compact matter represent the enamel rods completely preserved, while the narrower and lighter bands depict the spaces originally filled with the organic interprismatic substance. Delicate spiculae of inorganic matter form minute connecting bridges between adjoining prisms which are shown as faint lines passing across the lighter area of the interprismatic substance. These structures hold the rods together even after the organic enamel prism sheaths have been burnt out, thus making the isolation of single rods a difficult matter.

The disappearance of a part of the enamel (and I call particular attention to the fact that it is adult enamel), when heated, furnishes final and conclusive proof of my assertion, first voiced in 1906, that this tissue not only *does* normally contain organic matter, but that it is present in greater quantities than generally supposed.

ORTHODONTIC ERUPTION OF IMPACTED CUSPIDS AND INCISORS

By VARNEY E. BARNES, D.D.S., Cleveland, Ohio

(Read before the American Dental Association, Cleveland, Ohio, September 10-14, 1923)

THE normal eruption of any tooth occurs after normal bone development provides a space, for that eruption, in excess of the mesiodistal diameter of the tooth.

The excess space thus provided is evidently part of Nature's method of assuring an easy, painless eruption of the tooth crown by piercing the gum and allowing a continuous ring of gum tissue to constrict later about the smaller cervical circumference of the tooth.

Impacted teeth have not erupted because bone development has been deficient or defective, or because these teeth have met excessive resistance of bone, or other teeth, odontomes, gums or tumors.

The relief and eruption of impacted teeth, therefore, in all cases in which there is deficient bone development, necessitates the expansion of the dental arch to the extent that an *excess space* is provided for the subsequent orthodontic eruption of the impacted teeth.

The position of impacted teeth is usually such that their vertical axes are decidedly inclined away from the normal vertical axial inclination. The inclination deviation may be mesial, distal, labial or lingual, and is evidence of the impacted tooth's search for the path of least resistance.

The axial inclination mesially or distally with the mesiodistal diameter of the teeth necessitates the orthodontic production of a *much greater excess space* than the normal, and greater than that required for labial or lingual inclinations, which also require a space greater than the normal (Fig. 1).

The *excess space* orthodontically provided relieves some impactive pressures and usually starts the impacted tooth toward eruption. Impaction, however, is practically coincident with delay in eruption, and it is therefore advisable to hasten the eruption by surgically exposing the tooth and then erupting it orthodontically. The expansion appliance can be used for the eruption, but should be modified by the addition of suitable springs and wires for pressure application as well as the stabilization of the anchorage.

The expansion of the arch should use the teeth as a means of (physiologically) molding the bone by pressure through the teeth. This pressure must not merely tip the teeth; it should move them and the bone bodily, and only tip such teeth as require it to assume a normal inclination later. The excess space requirement will, however, often require an excess inclination or tipping of some teeth which can tip back to a normal inclination after the tooth erupts.

Expansion appliances for the relief

of impactions are preferably of the lingual or labiolingual type—massing the teeth of one side of the arch against those of the other side, to produce lateral expansion; then massing the side teeth against the individual anterior teeth, in order that space may not be stolen from the posterior molars which are developing, and are liable to be impacted by incorrect orthodontic pressures (Fig. 2, W and X).

When excess space has been attained by expansion, the appliance should be modified to form a retention to maintain the space until the impacted tooth is erupted. The appliance is also an anchorage for the additional springs and

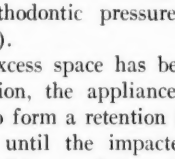

Fig. 1.—Illustrating necessity for excess space to permit eruption of impacted tooth.

attachments to be used in the eruption (Fig. 2, Y).

After the appliance is modified into a retainer, additional springs and bars are soldered to it to provide a support for a surgical dressing or pack (Fig. 2, Y and Z) which is to be gently fitted against the tooth, after its crown is exposed surgically. This fitting of appliance and dressing support is best done on a plaster cast duplicate of the dental arch. This cast should contain duplicate metal receptacles (usually tubes) like those in the patient's mouth, in order that subsequent fittings of the appliance may be made at the laboratory bench from time to time as treatment necessitates. It has been found advisable first to fit the appliance to a cast that contains the bands and attachments to be used in the mouth. Then the bands are cemented to the teeth and an accurate plaster impression taken and fitted with metal tubes duplicating those used in the mouth. The cast made from the latter impression is preferably made of Cloverleaf stone.

The appliances are made of noble metal alloys of stiff spring quality, and should be of a removable type, preferably locked into place and not removable by the patient.

When the expansion with excess space has been secured, and the retention and anchorage appliance is ready with all attachments except the final surgical

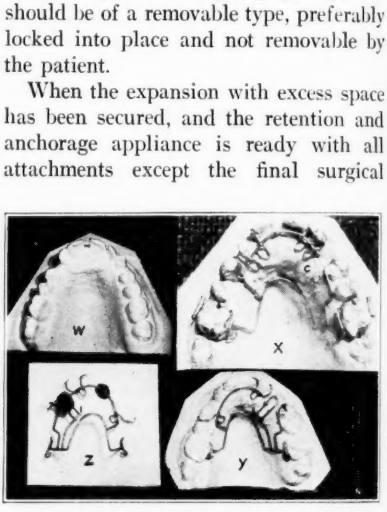

Fig. 2.—W, Lingual impaction of upper cuspid; X, Expansion appliance and anchorage. Cuspid at (C); Y, Expansion complete with excess space. Apparatus changed and simplified to retainer with dressing support; Z, Apparatus turned over to show pack or dressing fitted to its support.

dressing, the case is ready for the surgical exposure of the impacted tooth. A roentgenogram of the impaction region is advisable at this time, as it locates the impaction and indicates any change which may have taken place during expansion and since the prior roentgenogram.

The surgical exposure of the tooth may be done under local or general anesthesia. The gum should be cut by clean incisions and the plug removed from over the tooth very much in the form one cuts a plug from a watermelon. Pro-

viding a good surgical blade is used, the periosteum and bony crypt over and around the crown of the tooth may often be easily cut away. If the tooth is situated deep in the bone, bone drills and burs may have to be employed, but they must be used carefully to prevent laceration or serious injury of adjacent structures. It is advisable to expose the tip and at least half of the crown of the tooth. The removal of the bony crypt usually provides sufficient exposure. The complete surgical exposure of the half of the crown is made possible by the provision of excess space which permits of an operation without damage to adjacent teeth, particularly their roots and periodontal membranes.

As soon as the lower half of the crown is exposed to view by the surgical method, the surgical dressing or pack is fitted to fill the cavity made by the operation. The function of this pack is to replace the cut away tissues and at the same time prevent the healing or reformation of gum over the impacted tooth crown and permit rapid healing at the walls of the cavity (Fig. 3).

The dressing or pack may consist of guttapercha, temporary stopping, impression compound, paraffin, wax or spunk, saturated and covered with wax or paraffin. I designed and first used this pack, January 8, 1918, intending to use guttapercha, but at the suggestion of D. H. Ziegler of Cleveland, I used spunk as the base of the pack. I added the use of paraffin to saturate the dressing, thus giving impervious form against which the tissues might heal readily. Dr. Ziegler made the first surgical exposure as planned by me for the use of this first pack, in January, 1918. The results have been invariably satisfactory and without failure or infection.

The fitting of the dressings other than paraffin-saturated spunk are made by pressing the plastic material into the cavity to give it form. Paraffin-saturated spunk has been usually used because the spunk is not plastic at any body temperature and it can be built up with paraffin and molded to cavity form; and it will hold its form and position. The spunk is cut to the approximate form of the gum cavity which has been cut to expose the tooth crown. The pack of spunk is then pierced with three or more holes (preferably with a hot wire); these holes are to engage small wire extensions soldered to the main wire support, which,

Fig. 3.—W, Left upper cuspid impacted; X, Appliance simplified to retention and anchorage with excess space provided for cuspid; Y, Pack or surgical dressing added to appliance after surgical exposure of cuspid; Z, Cuspid exposed after perfect healing of gum. Cuspid now being moved outward to arch curve with spring and is fully erupted after movement beyond occlusion of lower teeth.

in turn, is soldered to the main appliance or anchorage. The spunk pack is then attached to the wire support with hot paraffin applied with a spatula, and enough paraffin is added to saturate the pack thoroughly. Additional hot paraffin is melted onto the surface which is to fit against the exposed tooth crown and surrounding gum (the depth of this paraffin layer being approximately 1/16 inch (Fig. 2, Z).

The appliance with the paraffin satu-

rated and covered pack is now carefully fitted into the vertical lingual tubes on the anchorage bands, and the pack is gently guided into the cavity that exposes the tooth. The pack with its still warm and plastic paraffin is gently pressed down upon the tooth crown to make the impression of the cavity and the tip of the tooth crown. This first impression is more or less imperfect, so the appliance is removed, and more paraffin added and the impression repeated until a perfect contour and contact is made without pressure in excess of that necessary to hold the pack in position. The pack is now a sort of inlay replacing the cut out tissues (Fig. 3,Y).

When the fitting has been accomplished, the appliance with the inlay or pack attached is now carefully removed from the mouth, the pack is cleaned, dusted with an antiseptic powder and then replaced in position in the mouth. The appliance is locked in position and the patient dismissed until the next day.

The second day the appliance is removed and cleaned with an antiseptic spray, the wound sprayed with a mild antiseptic or normal saline solution, and additional paraffin is added, if necessary, to press the gum away from the tooth. The pack is again dusted with a antiseptic powder and the appliance locked in place.

This treatment is repeated from day to day, thus permitting the gum to heal and leaving the crown exposed. After the first few days, every other day for two or three treatments will suffice for cleaning and possible changes. Usually a week or two is sufficient time to allow thorough healing; then the pack may be removed and attachments made to the tooth to erupt it.

Deeply situated impacted teeth may require a longer use of the pack, or for the spunk-paraffin pack there may be later substituted one made entirely of paraffin. The paraffin pack may be molded, while plastic, into the gum cavity after attachments are made to the tooth. Being plastic at body temperatures, the pack allows

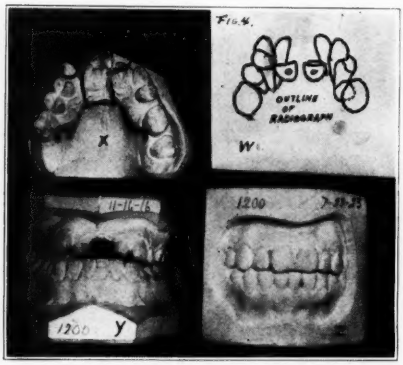

Fig. 4.—W, Outline of roentgenogram of two impacted centrals, the crowns pointed at the base of the nose; X, occlusal of case before expansion, with appliance used after expansion to hold dressings and erupt the teeth; Y, Front of case before expansion; Z, Front of case after expansion and eruption. Centrals were moved through an arc of over 160 degrees.

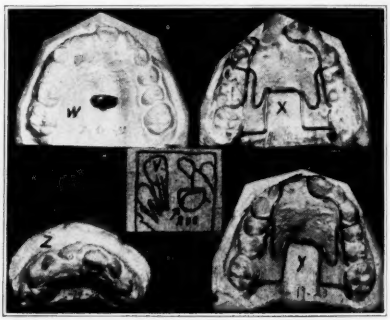

Fig. 5.—W, Impacted right upper central. Band and loop which was cemented to central; X, Excess expansion complete. Appliance now a retainer and ready for dressing support; Y, Dressing removed and bars added for eruption; V, Outline of roentgenogram showing central pointing to base of nose; Z, Right central partially erupted.

the tooth with springs, ligatures and attachments to move through it. At the same time the plastic paraffin keeps out food and mucus, as well as holding gums and lips out of the way.

Fig. 6.—Front of Figure 5.—X, Cast cut away for fitting of dressing and support. Note locking of anchorage on left central band; Y, Eruption attachment of appliance. A ligature fastened at angle mesial to left central pulls from labial and lingual loops on right central band; Z, Central partially erupted.

Incisors and cuspids whose crowns present a labial or cranial direction of eruption or impaction have the function of the lip as an additional difficulty to be overcome in their orthodontic eruption. The paraffin or paraffin-covered pack described seems to have solved this problem, since it allows the lip to glide easily over a smooth surface while the wound is healing, and later holds the lip out of the way as the tooth is worked down or through the plastic pack. I have successfully treated two cases of incisors pointing nasally with this method, with comfort to the patient. The incisors were moved through an arc of approximately 160 degrees without pulp devitalization (Figs. 4, 5, 6 and 7).

When the impacted tooth crown is finally revealed within the perfectly healed gum cavity, the case is ready for the next step, which is attachment to the impacted tooth.

Fig. 7.—Appearance of patient (Figure 5).—W, Labial bars and ligature attachments of appliance; X, Same apparatus covered with paraffin packing which allows ligatures to erupt the tooth through the paraffin. The paraffin protects the lip, prevents irritation and holds gums out of the way.

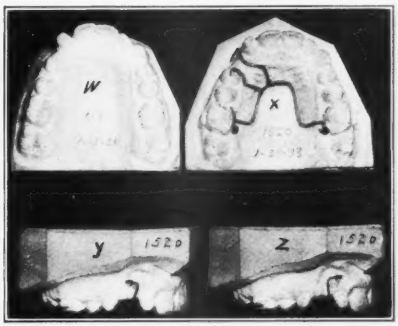

Fig. 8.—W, Right upper cuspid impacted labially to right lateral; X, Appliance modified to erupt cuspid after excess expansion and surgical exposure; Z, Labial curved spring passing mesially and lingually to cuspid crown and used to move crown distally and away from the lateral root; Y, Same spring modified to erupt cuspid after movement away from lateral.

The best attachment seems to be a band cemented to the crown and fitted with small non-irritating loops or hooks for spring or ligature attachments. The band may be measured and approximately fitted on the same incisor or cuspid of the other side of the arch and then fitted to the impacted tooth and cemented after the attachments are soldered to it.

A dentimeter may be used to measure the tooth itself and the band may be

fitted directly since the gum is perfectly healed in this method and vision is clear. The method permits of the fitting without haste or pain.

Under some conditions, such as deep seated impactions, the fitting of a band may be impracticable. In these cases, section that approximately fits the hole drilled into the tooth crown. The cavity end is upset at a point on the circumference, or a small spur is soldered at a point on the circumference so that the protuberance from the shaft may be slipped down through a groove cut in

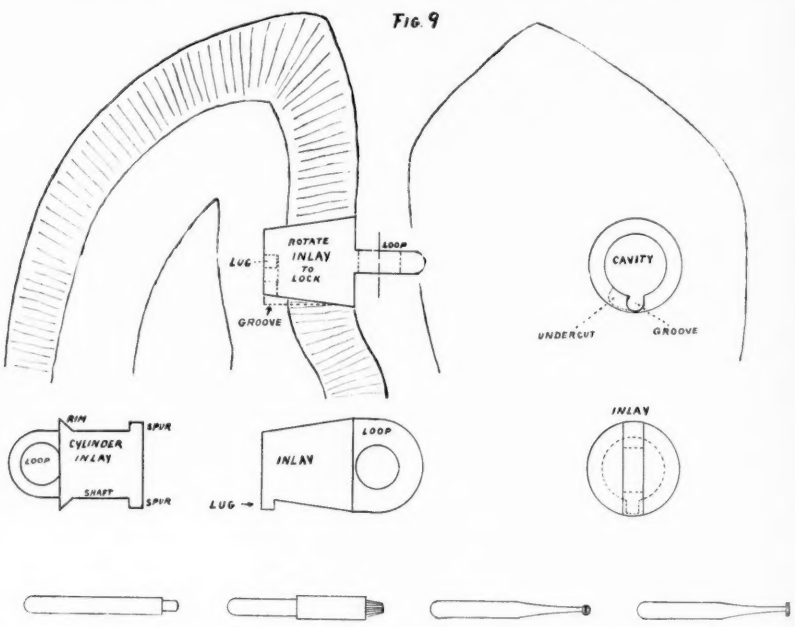

Fig. 9.—Locked inlay of cone form. Vertical groove to permit spur at tip of inlay to enter undercut at base of cavity cut in lingual of crown. Rotation of conical or cylindrical inlay locks inlay in addition to cementation.

or in other instances where desired, a hole may be drilled into the tooth crown (preferably lingual). The hole may engage the end of a spring, or a hook or eyelet may be screwed into it, or the roughened end of a hook, wire or eyelet may be cemented into it. All of these methods have been used successfully, but they are inferior to a locked inlay, hook or loop.

The locked attachment which I have suggested and used consists of a shaft the side of the cylindrical hole drilled in the tooth. The shaft is then rotated a few degrees so that the protuberance fits into an undercut which has been made at the bottom of the hole with a small wheel bur. The external part of the shaft may be a spur, loop or hook. The fitting described, when set in cement and rotated to locking position, becomes a locked inlay attachment.

After the tooth is erupted and in position, the outer extension may be ground

off and the fitting becomes an inlay. The groove cut in the side of the cylindrical hole is the only imperfection; it may be covered completely by countersinking the margin at the tooth surface or the hole may be cut in cone form with the groove near the tip of the cone point and the undercut at the tip. If carefully made, this form of inlay will not pull out or loosen (Fig. 9).

There is a condition of impaction in which the impacted tooth lies so close to the root of another tooth that the full exposure operation is impracticable. Such a condition is that of a cuspid crown resting against the root of a lateral, holding and forcing the lateral root lingually (Fig. 8, Z). In these cases the gum is held out of the way as usual, but the attachment to the tooth is made by a thin, curved spring wire slipped around a curve of the cuspid, or other tooth, and pressure gently applied to pull the impacted cuspid away from the other tooth root to a point where it may be safely banded.

Crown attachments having been made, the case is ready for the application of the pressures that are to erupt the tooth. The anchorage appliance is fitted with suitable extensions which supplant the pack support and serve as a means of attachment for ligatures or light springs to the crown attachment. The extensions are often the spring part of the attachment, the contact attachment being wire ligature .009 to .014 inch in diameter. A coiled spring, soldered to an extension from the main appliance, with a hooked end extension to the tooth attachment, direct or through a ligature, is a very efficient eruptive device, but it must be used carefully so as to move the tooth slowly.

Springs are not readily attached to crown fittings in deep impactions, and their accurate adjustment is difficult. The ligature attachment to a spring seems to be a happy solution of this difficulty.

The pressure applied to erupt an impacted tooth is preferably physiologic; that is, such as will produce a slow movement of the impacted tooth without noticeable inflammation or pain.

The direction of the pressure applied must be such that the resultant movement along the diagonal of the parallelogram of the orthodontic force and the resistance will be a movement of the tooth downward and away from the place previously occupied by its apex, or foramen. Any movement of an impacted tooth toward its apex is apt to be dangerous and may cause strangulation of the pulp. Movement of a tooth toward its apex is liable to be a resultant in conditions of great inclinations or in case the tooth has a curved root, as is too often the actuality. The obvious course is a slow and careful movement.

Eruptive or orthodontic pressures are seemingly best applied or reapplied at weekly intervals, allowing rest periods between. Some case conditions allow more frequent adjustments, others less frequent. The case conditions and results must guide this procedure until more definite information can be obtained.

The best results in eruption of impacted teeth seem to have been attained where the anchorage appliance is quite firm and the main spring attachments strong enough to resist the stresses of mastication. Such attachments prevent undue movement toward the apex at a time when excess movement might be dangerous to the life of the pulp.

Impacted incisors, cuspids and bicuspids should be seldom evident in the mouths of the patients of up-to-date dentists. Impactions can be prevented in these cases, by proper expansion of the arches of children of 5 to 7 years where the normal developmental spaces are not present. Impacted teeth are only the greater and more evident degrees of impactions which exist in all deficiently developed arches and jaws. The relief

of impacted teeth is often a tedious procedure. The roots of such teeth are too often curved and imperfectly formed by undue pressure present during their formation. The orthodontic eruption of impacted teeth is at times seemingly spectacular, but the results at best are inferior to the prevention of impaction by preventive orthodontia.

Summary

1. Expand to provide *extra space* for impacted tooth.
2. Fit removable retainer as anchorage. Add springs and hooks to hold surgical packing.
3. Expose impacted tooth surgically.
4. Fit packing of paraffin-saturated spunk over tooth to fill wound. Attach to retainer. Cover packing with antiseptic powder and lock appliance in place.
5. Apply antiseptic and replace frequently until wound heals, exposing tooth.
6. Band tooth, if possible, or drill pit for special locked inlay, carrying loop or hook.
7. Erupt tooth with orthodontic pressure.

Discussion

Herbert A. Pullen, Buffalo, New York: The surgical and orthodontic technic involved in the release from impaction and the gradual eruption of the incisors and cuspids is a technic that has bothered not a few orthodontists and many dentists, and not until one has had some experience with these impactions can he obtain results which are satisfactory, and perform the necessary operations with skill and ease.

Dr. Barnes has given us the result of many years of experience with these difficult and stubborn cases, and I can recommend practically all that he has said for your favorable consideration.

Perhaps the stressing of some of the more important phases of the surgical and orthodontic technic, by giving a reason for them, which is convincing, may help to illustrate the value of the technic presented.

For example, take the matter of sequence of the various operations. The appliance for erupting the impacted cuspid or incisor and for enlarging the dental arch as a whole and at the place of eruption of the impacted tooth is made first; next, the dental arch is made large enough to accommodate the impacted tooth, and then the crown of the tooth is surgically exposed for the cementation of a metal tip with ring. Finally, the tooth is orthodontically erupted into its place in the dental arch. This sequence is important, for one cannot reverse it, nor interchange these steps, although occasionally the space may be opened at the same time that the impacted tooth is being orthodontically erupted.

Again, there is a reason for the gaining of the excess space in enlarging the space for the final position of the impacted tooth, as otherwise the tooth will meet with resistance on either side through contact with adjoining teeth, which will interfere with the facility of and delay the eruption of the tooth unnecessarily.

Bodily movement of the teeth is not always necessary in these operations, and I do not think that Dr. Barnes so advises, but it is vitally necessary that the anchorage be secure enough so that the appliance is not forced into the soft tissues. Thus it is that the reinforcement of the molar anchorage attachments by bands and tubes on one or more of the anterior teeth, locking extra spring arms from the appliance into such tubes, is a valuable addition to the mechanics of the treatment.

Furthermore, it will be observed that Dr. Barnes has illustrated and described a lingual arch technic for both lingual and labial impactions, thus giving one the advantage of the latest technic which could be approved by the most exacting orthodontist or periodontist.

In order, also, to avoid the obscuring of the field of vision in these operations and the interference with the necessarily fine technic upon the tip of the impacted tooth, Dr. Barnes cuts out a plug of gum tissue over the impacted tooth and immediately clears the field of cumbersome flaps of gum tissue which would otherwise interfere at the first and subsequent sittings of the patient.

The use of and refinement of the surgical pack by using spunk and paraffin gets rid of the pressure backward into the alveolars of the impacted tooth, which often happens when guttapercha is used.

Hugh G. Tanzey, Kansas City, Missouri: Many of the younger orthodontists hesitate to undertake the orthodontic eruption of impacted teeth, and all of you who have attempted it know that sometimes it is rather difficult, but as a rule it is about as easy as any of the other tooth movements we attempt to ac-

complish. Our method is simply to remove the soft tissues and bony parts covering the impacted tooth, and at the same sitting insert a little post or hook, using mostly the labial appliance, as then the force of mastication has no tendency to imbed the appliance in the soft tissues. We use packs only at the time we operate to remove soft tissues. We set the post at that time, using a small iridioplatinum wire while there is no bleeding. The entire operation can be done in about one and one-half hours without any trouble. The tissues begin to heal at once, and a very nice operation is made.

B. Frank Gray, San Francisco, California: I believe it is the experience of practically all orthodontists that the treatment of impacted cuspids is most tedious and difficult. The idea of securing ample room for the eruption of the tooth is most valuable. I think that point is too often overlooked. Of course it is often possible to secure attachment to these impacted teeth without cutting into them at all. It is almost unbelievable if not uncanny to see how a tiny swaged cap can be cemented to the tip of the cuspid and made to do satisfactory service. An impression may be secured from the corresponding tooth on the other side.

Dr. Barnes' suggestion that impactions should seldom be found in the mouths of patients of up-to-date dentists is commended to the profession. If dentists would only realize the importance of full roentgenographic examinations of all children coming under their care many of these really serious results of neglect would be obviated.

William C. Fisher, New York City: Dr. Barnes' paper demonstrates his ability to pay attention to the fullest details of his work. In emphasizing the importance of this characteristic of Dr. Barnes, I am answering, in a way, the remarks of Dr. Tanzey. Dr. Tanzey referred to the old method of drilling a hole into the tooth into which a pin was cemented. That has been more or less a common practice among orthodontists for a great number of years. I think the thing that has been missed by many is that Dr. Barnes is not satisfied with the ordinary methods of this sort. He advises a drill that will cut the cavity to an exact size and shape, and, not satisfied with that, he makes it fool-proof by cutting a shoulder on it so that it cannot go beyond a certain point. The drill has been devised by an orthodontist to assist the general operator in protecting the pulp so that there will be no reflection on the orthodontist such as could arise through devitalization of the pulp, a condition which might not become apparent until the tooth is brought down. Dr. Barnes brings the tooth down and safeguards the pulp. He is to be commended for his exceptional regard for detail.

I want to stress Dr. Pullen's remarks calling attention to Dr. Barnes' lingual appliance, because these cases are usually at an age when the patient is pretty sensitive. We get them most frequently between the fourteenth and eighteenth year. That is an age when they are just beginning to be sensitive and they do not want any unnecessarily conspicuous appliance in the mouth. Dr. Barnes has an appliance that can be kept firmly in place and yet it is removable for cleaning.

Dr. Barnes (closing): In reply to Dr. Tanzey, the method he suggested is the one we have used twenty or twenty-five years, and while we had success in some cases, in deep seated impactions the gum would close over the spur. When we applied pressure or reapplied it, we had to poke down into the gum, with danger of infection. Also there was danger of pressing the tooth toward the apex, with the possibility of devitalizing the pulp. We have, accordingly, worked out a technic that would clearly expose the tooth so that we would not be proceeding blindly as we had done. Too many things are still obscure in orthodontic treatment. Again, in drilling into a tooth under the old method, we could not take the necessary care, and, besides, what about the pin in the tooth after you are through? Will you drill it out and make a larger cavity? Why not make the inlay at once?

I appreciate the remarks of Dr. Jackson. The spunk method seems crude. It did to me at first. However, it holds its shape at body temperatures, is easily adapted, and, paraffin saturated, it gives a sanitary surgical pack. If we have a pin buried in the gum and have to make attachments to it, the operation is neither sanitary nor safe; we do not see what we are doing.

SECRETARY'S REPORT TO THE DENTAL EDUCATIONAL COUNCIL OF AMERICA

By ALBERT L. MIDGLEY, D.M.D., Sc.D., Providence, Rhode Island

(Read before the American Dental Association, Cleveland, Ohio, September 10-14, 1923)

IN ACCORDANCE with the provisions of section three of the Constitution and By-Laws of the Dental Educational Council of America, the report of the secretary is herewith submitted.

The past two years mark an epoch in the realm of dental education while the activities of the Council are in many respects the most significant and constructive in its history. In this era of dental educational progress, it is gratifying to note the earnest cooperation and interest taken by the schools, the profession and the examining boards in the affairs of the Council and to observe the healthy development in scope and quality of the Council's usefulness.

The past year has witnessed the conclusion of the survey and classification of all American Dental Schools, the decision to require one year of pre-dental collegiate work in 1926, and also the consolidation of the National Association of Dental Faculties, the Dental Faculties Association of American Universities, the American Institute of Dental Teachers and the Canadian Dental Faculties Association into the Association of American Dental Schools.

This survey and classification has been a work of greater magnitude than may appear from the reading of a mere resume of it. It is the culmination of a task that involved a thorough examination of every dental school in this country and it is the hope of the Council that the result of its efforts shall not only merit the approval of the parent bodies but will be fruitful of benefit to the profession and the public.

Meetings of the Council

The continuation of the survey of the dental schools and their classification with all the details incidental thereto required three unusually long meetings of the Council during the past academic year. The first of these was held in New York City, with morning and afternoon sessions from October 23 to October 28 inclusive. The Council convened again in Atlantic City, December 11 to 15 inclusive, holding morning and afternoon sessions each day, and three evening sessions. The third meeting took place in New York City, May 28 to May 30 inclusive, with morning, afternoon and two evening sessions. In addition to these three meetings, two important committee meetings were held in New York City on October 7 and 8 with morning, afternoon and evening sessions.

During these meetings the schools were classified, under the regulations set forth in the Gray Book; the Council's minimum requirements for Class A schools were revised and a numerical point system, whereby the worth of a school might be more accurately measured, was devised and used, in determining the final rating given each school. This classification has recently been made public.

Revision of Council's Minimum Requirements

The Gray Book of the Council published in 1920 has been thoroughly revised and many additions made thereto, the most significant of which is the enforcement of the pre-dental year standard in 1926. The Council adopted this standard believing the best interests of the public and profession will demand its enforcement, and that a three-year notice in

advance to the schools and to prospective students is both ample and just.

It is the hope of the Council that the revised requirements now known as the Green Book and adopted October 23, 1922 will have the endorsement of the schools, the dental and medical professions and the public.

The Point System Used In Classification

Convinced that a basis of real comparison of schools can be reached more accurately and effectively by a uniform system of grading than by the older method of relying solely on the opinions and estimates of inspectors, the Council adopted a point system which eliminates to a marked degree those factors and influences that often preclude the formation of accurate and just conclusions. Since nothing of this kind had been used previously in dental education, it was necessary to devise one, and that such a new system should be without flaws can not be expected. It is the opinion of the Council that this system has not worked injustice to any school, at least as far as classification is concerned. The Council is aware that certain items should be modified or eliminated and a committee has been appointed for this purpose.

Briefly presented, the system comprises the following ten main groups each of which has a value of ten points:

1. Location and Building; 2. Organization and Administration; 3. Finances; 4. Faculty and Teaching Staff; 5. Entrance Requirements and Advanced Standing; 6. Curriculum and Course of Study; 7. Academic and Medico-Dental Subjects; 8. Dental Technology; 9. Clinical Dentistry; 10. State Board Record.

Each of the ten main groups is sub-divided into sections or items that are properly included under their respective groups. Each of these sub-divisions has a numerical value. The sum of the numerical values of all items under one group is equal to the numerical value of the main group, namely ten points. In using the point system each member of the Council, after hearing the report of the school, writes his estimate of the value of each item on a prepared vote sheet, his estimate of each item never exceeding the valuation which the Council has named for each item. He then totals each group and the sum of all groups represents the grading the individual member of the Council gives to the school. Thereupon the grades given each school by all members voting are added, an average is found and this determines the rating of the school.

Classification of the Dental Schools of the United States

The Council presents herewith, as part of this report the classification of the schools of this country, with the belief that all schools have been justly rated. Furthermore, it views with gratification the outstanding improvements that have been made generally, and looks forward hopefully to a continuation of the constantly growing interest and progress which have been so noticeable in dental education during the past five years.

During the academic year 1921-1922 each school of this country was visited by William J. Gies, director of a study and survey of dental education, sponsored by the Carnegie Foundation for the Advancement of Teaching. Dr. Gies was accompanied by at least two members of the Dental Educational Council of America. The inspectors representing the Council on these visits presented to the Council a detailed written report of their observations as to the status and quality of the schools they visited. An improved system of rating the schools was adopted, each school has been rated thereon, and reclassified, in accordance with the findings of the respective committees of inspection and the knowledge of the individual members of the Council.

The classification of each school was reported to the respective Deans and with the classification were enclosed Report Forms No. 1 and No. 2 and a statement entitled "Suggested Improvements and Comment."

Report Form No. 1 indicated the rating of the school under each of the ten main groups of the Council's "Point System" of rating, the letters A, B and C signifying values within the range of the conventional A, B and C classification in general. (Report Form No. 1 is presented as a part of this report.)

Report Form No. 2 indicated the rating of the school on each section of each group as outlined in the Council's "Point System." (Report Form No. 2 is presented as a part of this report.) The key to the grading system used in connection with these report forms is printed at the foot of page one on each form.

The statement "Suggested Improvements and Comment" outlines the weaknesses and excellences of each school and among other things expresses the hope that all the suggested improvements will be made promptly in the interest of greater effectiveness in the work of the schools.

During the interim between December 15, 1922 and May 28, 1923, all schools that dissented from the Council's findings were given an opportunity to be reinspected before the

tentative classification made in Atlantic City in December, 1922 was confirmed in New York City in May, 1923.

The Council aims to deal impartially, constructively and sympathetically with the problems affecting its relationship with the individual schools. In carrying out this function it has no desire to interfere with the activities of any school. If any of its regulations are not in accord with the necessities and ideals of dental education or if inaccuracies have appeared in any of its findings, it eagerly seeks correction. It hopes to avoid even the appearance of obtrusiveness, and trusts that neither the irritation of any individual nor resentment towards its activities have resulted from the unpleasant task of notifying schools of what have appeared to be their deficiencies.

Publicity of Classification

The classification of the schools by the Council was given wide publicity through publication in many of the leading dental and medical journals and in the newspapers. The country was covered effectively through the press, for many newspapers not only published the Council's statement and classification but also used their editorial columns freely in our service. The Council takes this opportunity to thank those members of the dental profession in various parts of the country who assisted so willingly in the presentation of the Council's statement through the press.

Review of the Classification of 1918, 1920 and 1923

A comparative analysis of 1918, 1920 and 1923 classifications reveals clearly the progress that has been made since March, 1918. The initial classification of 1918 resulted in sixteen A, twenty-six B and five C schools. The second classification in 1920 resulted in nineteen A, twenty-four B and four C schools. The third classification in 1923 resulted in twenty-one A, sixteen B and two C schools and four deferred.

Three schools have become organic parts of universities during the past academic year. In these three classifications, the Council has published six schools as Class "C" and it is interesting to note that all were independent schools. At the present time but two of the Class "C" schools alluded to are in existence, the remaining four merged with universities or were discontinued. It is the hope of the Council that all State Dental Examining Boards may have the statutes governing their duties so revised that they will refuse to examine the graduates of Class "C" schools.

Three schools that were classified "A" in 1918 and 1920 have been demoted and are now in Class "B". Seven schools that were classified "B" in 1918 and 1920 have been promoted and are now in Class "A".

In March, 1918 there were 48 dental schools in the United States and of these 28 or 58 per cent were university schools; 19 or 39 per cent independent schools and one semi-state institution. Of 43 schools in 1923, 32 or 74 per cent are university schools; 9 or 20 per cent independent schools, one affiliated with a university and one a semi-state institution. The Council would draw attention to the fact that 52 per cent of the independent schools of March, 1918 have become organic parts of universities or have been discontinued since that date.

In 1918, 14 or 87½ per cent of the 16 "A" schools were under university control and in 1923, 20 or 95 per cent of the 21 "A" schools are under university control. In 1918, one or 6 per cent of the 16 "A" schools was an independent school and in 1923, one, or 5 per cent of the "A" schools is an independent school.

In 1918, 15 or 57 per cent of the 26 "B" schools were under university control and in 1923, 11 or 68 per cent of the 16 "B" schools are under university control. In 1918, 11 or 43 per cent of the 26 "B" schools were independent and in 1923, 4 or 25 per cent of the "B" schools are independent. Since 1918, 5 independent schools have merged with universities, one merger is in process of negotiation, one nearly complete merger of an affiliated school is in prospect. Of the 43 schools at the present time, 32 are organic parts of universities, 9 are independent, one is a semi-state institution and one is affiliated with a university.

Reflecting upon the rate of progress in dental education prior to 1918, and comparing the standards of the White Book on which the 1918 classification was founded and those of the Gray Book on which the present classification is based, and with a study of the analysis herewith presented, may we not conclude that the progress made since 1918 is substantial? Indeed, these figures prove conclusively the effectiveness of classification.

The rapid forward trend in dental education is emphasized by the fact that many privately owned schools have recently become organic parts of universities. It is becoming more obvious as time goes on and standards are raised that it is increasingly difficult for independent schools to attain Class "A" standards. And moreover it is gratifying to note that the few remaining schools of this type realize fully their duty to the dentistry of the present

and the future and are both willing and anxious to merge with universities. With this wholesome spirit on their part toward university relationship and with the awakening interest in dental education within the dental and medical professions, we need have no fear for the security of the world-wide supremacy which American dentistry has always held.

Financial Support

It is apparent that the Council's position in matters pertaining to dental education has become stabilized and is permanent. To maintain this stability and permanency, a definite annual appropriation should be made by the American Dental Association and sufficient funds should be available to promote effectively the work of the Council. The Council should not be dependent upon the generosity of examining boards and the schools.

Generous contributions from the National Association of Dental Faculties, The American Dental Association, The National Association of Dental Examiners and schools in neither Faculties Association have made possible the work of the Council, and for this practical assistance the Council expresses its deep appreciation and sincere thanks. The material assistance of the Carnegie Foundation for the Advancement of Teaching during this constructive period is gratefully acknowledged.

In this eventful period of progress in dental education it is fitting that the Council should express its appreciation of the unusual and unlimited services of William J. Gies, in behalf of dentistry and dental education, for without his cooperation, the work could not have been done as expeditiously nor as well.

The Council concludes with the earnest hope that the great bodies in dentistry will continue as always heretofore, to cooperate loyally with the work of the Council to the end that dental education may assume its rightful position as one part of the great movement for the betterment of dental service to humanity.

DETAIL OF RECEIPTS

From schools 50¢ per student on 1921-1922 Enrollment—		
July 28, 1922, University of Buffalo	$ 106.50	
Aug. 29, 1922, Howard University	129.00	
Aug. 29, 1922, Western Reserve University	104.00	
Oct. 1, 1922, College of Physicians and Surgeons of San Francisco	117.50	
Oct. 1, 1922, Creighton University	88.50	
Oct. 1, 1922, St. Louis University	111.00	
Oct. 1, 1922, Meharry Dental College	150.00	
Oct. 1, 1922, Vanderbilt University	88.00	
Oct. 1, 1922, University of Southern California	227.00	
Oct. 1, 1922, University of Maryland	98.00	
Oct. 1, 1922, Ohio College of Dental Surgery	83.50	
Oct. 1, 1922, Chicago College of Dental Surgery	216.50	
Oct. 1, 1922, University of Tennessee	49.00	
Oct. 1, 1922, Temple University	152.50	
Oct. 1, 1922, N. Y. College of Dentistry	349.00	
Oct. 1, 1922, Louisville Dental College	66.00	
Nov. 9, 1922, Atlanta Southern Dental College	162.50	
Dec. 6, 1922, Baylor University	55.00	
Dec. 6, 1922, Kansas City-Western	154.50	
Dec. 6, 1922, University of Pittsburgh	330.50	
Dec. 29, 1922, University of Buffalo	93.50	
Jan. 18, 1923, University of Denver	95.00	
Jan. 18, 1923, Baltimore College of Dental Surgery	113.00	
Jan. 18, 1923, Medical College of Virginia	53.00	
Feb. 10, 1923, N. Y. College Dental and Oral Surgery	308.50	
Feb. 10, 1923, Tulane University	127.50	
Feb. 10, 1923, Indiana Dental College	159.00	
Feb. 10, 1923, North Pacific	285.00	
Feb. 10, 1923, Loyola University	25.00	
March 30, 1923, Montreal University	100.00	
April 24, 1923, Marquette University	268.50	
April 24, 1923, Howard University	118.00	
April 24, 1923, Northwestern University	250.00	
Aug. 25, 1923, Georgetown University	70.00	$ 4,904.50
Interest—		
July 30, 1922	$ 10.60	
Aug. 31, 1922	.78	
Sept 30, 1922	.90	
Oct. 21, 1922, Liberty Bond Coupons	106.26	
Oct. 31, 1922	.91	
March 31, 1923	2.76	
April 30, 1923	1.29	
Sept. 1, 1923, Interest on Newfoundland Bond	18.33	141.83
		5,046.33
From State Boards—		
July 28, 1922, Alabama State Board	$ 25.00	
July 28, 1922, Missouri State Board	20.00	
Aug. 29, 1922, Rhode Island State Board	50.00	

Aug. 29, 1922, Arkansas State Board	20.00	
Aug. 29, 1922, South Dakota State Board	25.00	
June 30, 1923, North Dakota State Board	25.00	
June 30, 1923, Nebraska State Board	25.00	
June 30, 1923, Montana State Board	25.00	
June 30, 1923, Tennessee State Board	25.00	
June 30, 1923, Georgia State Board	25.00	
June 30, 1923, New Jersey State Board	50.00	
June 30, 1923, Indiana State Board	25.00	
Aug. 27, 1923, Oregon State Board	25.00	
Aug. 27, 1923, Alabama State Board	10.00	
Aug. 27, 1923, Utah State Board	25.00	
Aug. 27, 1923, Minnesota State Board	50.00	
Aug. 27, 1923, Nebraska State Board	25.00	
Aug. 27, 1923, Wisconsin State Board	20.00	
Aug. 27, 1923, North Dakota State Board	25.00	
Aug. 27, 1923, Michigan State Board	25.00	
Aug. 27, 1923, New York State Board	25.00	
Aug. 27, 1923 Montana State Board	25.00	
Sept. 1, 1923, Massachusetts State Board	25.00	
		$ 620.00
Bonds—		
Nov. 10, 1922, Government Newfoundland Bond	1,000.00	
Dec. 29, 1922, Liberty Bonds	2,981.21	
Feb. 1, 1923, Liberty Bonds	992.51	
		$ 4,973.72
Reinspections—		
April 24, 1923, Southern California	$ 900.00	
May 31, 1923, University of Buffalo	242.60	
May 31, 1923, Washington University	244.88	
May 31, 1923, Tufts Dental College	288.39	
July 2, 1923, Western Reserve	166.72	
June 4, 1923, Medical College of Virginia	227.28	
Sept. 1, 1923, University of Tennessee	232.90	
		$ 2,302.77
Refunds—		
May 16, 1923, Dr. Ward	127.21	
May 31, 1923, Dr. Owre	.16	
		$ 127.37
		$13,070.19
June 6, 1923, American Dental Association	1,000.00	
June 25, 1923, American Dental Association	1,200.00	
Aug. 2, 1923, American Dental Association	800.00	$ 3,000.00
Total Receipts from July 1, 1922, to Sept. 5, 1923, inclusive		**$16,070.19**

STATEMENT OF RECEIPTS AND DISBURSEMENTS

July 1, 1922 to September 5, 1923.

Receipts

Balance on hand, July 1, 1922		$ 7,040.91
Dental Schools per capita	$ 4,904.50	
State Boards	620.00	
Re-inspection of Dental Schools	2,302.77	
American Dental Association	3,000.00	
Miscellaneous Income	127.37	
	$10,954.64	
Interest on Newfoundland Bond	18.33	
Interest on Liberty Bonds	106.26	
Interest on Bank Deposits	17.24	
	$11,096.47	
Sale of four (4) Fourth 4¼% Liberty Bonds	3,973.72	
Sale of Newfoundland Bond—5½%	1,000.00	$16,070.19
Total Receipts		$23,111.10

Disbursements

Travel Expense for Council Meetings	$ 9,377.42	
Travel Expense for Inspection Trips	2,952.98	
Travel Expense for Committee Work	566.01	
Printing, Stenography and Supplies	1,410.10	
Postage and Express	131.30	
Telephone and Telegraph Service	655.87	
Professional Service	120.00	
Administrative Expense	1,400.00	
Council Meeting Expense	83.61	
Miscellaneous Expense	76.31	
Total Expenses	$16,773.60	
Refund of Overpayment	$ 50.00	
Purchase of five (5) Fourth 4¼% Liberty Bonds	5,042.00	
Purchase of Newfoundland Bond, 5½%	1,000.00	
Purchase of No. 3 Underwood Typewriter	114.00	
Purchase of Steel Filing Cabinet	59.00	
Purchase of Mahogany Table	6.00	$ 6,271.00
Total Disbursements		$23,044.60
Balance as per certificate of Industrial Trust Company at close of business, 9/5/23		$ 66.50

I hereby certify that I have examined the books of account of the Dental Educational Council of America, Albert L. Midgley, Treasurer, for the period July 1, 1922 to September 5, 1923 and that the above statement correctly reflects the receipts and disbursements for that period as revealed by said examination.

Respectfully submitted,

GEORGE M. REX,
Certified Public Accountant.

The Journal of the American Dental Association

5 North Wabash Avenue, Chicago, Illinois.

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Editorial

THE CHRISTMAS SPIRIT

What a wondrous wealth of sentiment and cheer clings around the hallowed memories of the blessed Yuletide! Every year no matter what the stress and strain of business, or plague, or panic, or disaster, or calamity, or crime, or war, or want, there comes this one bright spot in our existence. Pity that the world could not pattern after the patron saint of the mistletoe and holly, and extend the charity of Christmas on into the entire twelve months of the year. There is scarce an ogre of fiercest mien who does not bend a bit, and soften under the mellowing influence of dear old St. Nicholas. Wrapped in the mantle of many a blessed memory he waves his magic wand of peace and good will over the sons and daughters of men, and bids them enter into the kingdom of happiness and harmony.

At this season of the year we think more kindly of our fellowmen—we look more charitably on their faults and frailties. We reach out the hand more willingly to help a needy brother, and we do not pry too closely into why he needs. We consider only that he needs, and that we can help him. We dispense our bounty with lavish and liberal good will, content only if we may thereby bring a smile to the lips, and happiness to the heart. Out on the horizon of the future we look with broader vision, and catch a glimpse of the universal brotherhood of man.

It is hard to think of war, and strife, and envy, and rage, and hate when the whole civilized world is in the embrace of the Christmas spirit—it is hard to think ill of one's fellowman. Naturally the impulses lead us to the kindlier, holier, happier things of life. We reach down to pat the rosy cheek of childhood, and bend low in loving solicitation over the decrepit form of age. We are as one with the great throbbing, aching heart of humanity, and we would not willingly censure the vilest

wretch that lives. We gladly hail the day as the harbinger of love and light, of hope and happiness, of good cheer and charity.

Our sympathies expand under the spell of Christmas, and we think only of generous deeds and kindly acts. We sink self in the great all-embracing bond of beneficence, and find it more blessed to give than to receive.

For the members of our profession, Christmas brings a peculiar privilege. It brings the privilege of joining in a common impulse to succor our needy fellowmen. Through the medium of the Christmas seals each dentist may do his mite to swell the fund which the Association has been accumulating for some years, and which when large enough will bring a substantial income to help our needy and unfortunate brothers. Surely no man in the profession will hesitate to send in his small remittance when the individual amount is so nominal, but when in the aggregate of our entire membership it becomes such a magnificent contribution to the sum total of the relief of human want and suffering.

Down deep in the heart of every man there is the impulse to do something for his fellows. Without this impulse we must inevitably drift back into barbarism, and the farther we get away from barbarism the more generous and willing we are to give. When the Christmas seals are delivered at your office, sit right down at once and obey the better impulse of your heart and send the dollar. You will be made happier thereby—doubly happy—because of having done a noble deed, and having made some one else happy. *Do it now.*

DUES ARE RAISED

At the Terre Haute session the dues of the Indiana State Medical Association were made seven dollars for the year 1924. This increase in the dues was made necessary on account of the adoption of a plan whereby the public is to be educated as to what the medical profession has done and is doing for the benefit of humanity. As a part of this education there will be information given to the public as to the consistency and advisability of maintaining a high educational standard of fitness for those who seek to practice the healing art. Two dollars more per year from every member of the Association means nothing in the way of a hardship to the members, for as we have pointed out before in discussing the merits of taxation by our Association, there isn't a doctor in the state who every week doesn't waste more money

in frivolity or unnecessary expenditures than in a whole year is paid out in dues to the State Medical Association. Think of the money that probably half of the membership of the Association pays out in dues to golf associations, or for other luxuries of one kind or another. The trouble of it is we have gotten so stingy, and we have disregarded our own welfare so much and so long that we howl until we are black in the face if asked for a dollar for a medical society that returns the value to us a thousandfold. On the other hand we smile and jump at the chance to pass out money to a country club, an organization to promote the gentle art of poker playing, or a society to provide the best brand of entertainment of one kind or another. The truth of the matter is we ought to be ashamed of ourselves for having been niggardly so long, and for having served as a stumbling block to the progress of many things directly or indirectly connected with our own advancement as medical men. We may not chortle as gleefully as the chiropractors when they hand out twenty-five or fifty dollars per year for their cults, but at least let us gratefully accept the raise in dues and show that we are in sympathy with all that the Association is trying to do by paying in our seven dollars per year on or before the first of the year.—Editorial in the *Indiana State Medical Association Journal*, October, 1923.

THE CULT OF ABRAMS AND THE SCIENTIFIC AMERICAN

The "Electronic Reactions of Abrams" are being investigated by the *Scientific American*. While *The Journal* is still of the opinion expressed several times, that the whole scheme is so preposterous a fake as to stand self-condemned, yet, there are, presumably, some people who demand demonstrable evidence of the fact that the moon is not, and never was, made of green cheese. A preliminary article regarding the investigation to be undertaken by the *Scientific American* appeared in the October, 1923, issue of that publication. The first test to determine the accuracy of the "Electronic Reactions" diagnosis is reported in detail by the managing editor of the *Scientific American* in the current (November) issue. It makes amusing reading. Six tubes of pure germ cultures were submitted to an Abrams disciple with the request that he identify the cultures. The first tube was a pure culture of typhoid. The Abramsite diagnosed it as "acquired syphilis,

congenital syphilis, tuberculosis, gonorrhea, pneumococcus, malaria and influenza" but failed to diagnose typhoid. The second tube was a pure culture of pneumococcus. The "Era" ("Electronic Reactions of Abrams") gentleman diagnosed the contents of this tube as "congenital syphilis, tuberculosis, gonorrhea, malaria, influenza and colon septicemia" but did not find what it really was, pneumococcus. The fourth was a tube containing a pure culture of tetanus. It was diagnosed as "malaria, influenza, colon septicemia and diphtheria," but not tetanus. The sixth culture was of diphtheria. The Abrams wizard found "congenital syphilis, tuberculosis, gonorrhea, pneumococcus, malaria and colon septicemia." And so it went. When the Abrams disciple found that he was falling down hopelessly he began casting around for excuses. Looking at the vials which he had already tested he discovered for the first time that the labels had red edges and bore blue handwriting. This catastrophic chromatic combination, naturally, shot the "Era" all to pieces. The disciple explained how, quite recently, he had obtained very unsatisfactory results all one morning to find later that the cause was due to his "subject" (the healthy individual whose abdomen is percussed) having a piece of red cardboard, a theater seat check, in his trousers pocket. However, the *Scientific American's* committee removed the red-bordered labels with the blue handwriting and substituted a set of plain labels prepared on the typewriter; but the diagnostic results were no more satisfactory than before. It may be said in closing that Albert Abrams has disowned the disciple who flunked the tests as not being a Simon Pure hundred percenter and has promised the *Scientific American* to give a personal demonstration "sometime in the near future, if time permits." The whole thing is very funny and very foolish.—*Journal American Medical Association*, October 27, 1923.

THE DALLAS MEETING

Sixty-Sixth Annual Session

American Dental Association

To be Held in

DALLAS, TEXAS

November 10, 11, 12, 13, 14, 1924

RUSSIAN RELIEF

FLORIDA STATE DENTAL SOCIETY

Florida State Dental Society		$ 200.00

ILLINOIS STATE DENTAL SOCIETY

Champaign Danville District Dental Society		$ 50.00	
Chicago Dental Society:			
T. W. Brophy, Chicago	$100.00		
West Suburb Branch of Chicago Dental Society:			
S. Isreal, Chicago, Ill.	$5.00		
E. W. Elliot, Chicago, Ill.	4.00		
Nathan Styrt, Melrose Park, Ill.	4.00		
H. L. Akin, Maywood, Ill.	3.00		
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R. J. DeAmo, Melrose Park, Ill.	3.00		
D. R. Dawson, Melrose Park, Ill.	3.00		
M. G. Fox, Chicago, Ill.	3.00		
J. Y. Hurdle, Maywood, Ill.	3.00		
C. Miller, Maywood, Ill.	3.00		
C. F. Rockey, Oak Park, Ill.	3.00		
W. E. Werninghouse, Melrose Park, Ill.	3.00		
A. W. Campbell, Chicago, Ill.	2.00		
Walter Edlund, Maywood, Ill.	2.00		
L. F. A. Hein, Oak Park, Ill.	2.00		
E. A. Prugh, Oak Park, Ill.	2.00		
John L. Wagner, Chicago, Ill.	2.00		
L. V. Magoon, Oak Park, Ill.	1.00	$ 51.00	
J. P. Buckley, Los Angeles, Cal.		50.00	
F. F. Molt, Chicago		50.00	
William H. G. Logan, Chicago		50.00	
T. L. Grisamore, Chicago		50.00	
Chicago College of Dental Surgery		50.00	
Benjamin S. Partridge, Chicago		50.00	
Northwestern University Dental School		50.00	
Victor H. Fuqua, Chicago		50.00	
Frederick B. Morehead, Chicago		50.00	
Englewood Branch, Chicago Dental Society		50.00	
Northwest Side Branch, Chicago Dental Society		50.00	
Kenwood-Hyde Park Branch, Chicago Dental Society		50.00	
C. N. Johnson, Chicago		50.00	
Thomas L. Gilmer, Chicago		50.00	
Evanston Dental Luncheon Club		50.00	
H. E. Phillips, Chicago		45.00	
Arthur D. Black, Chicago		26.00	

Fred W. Gethro, Chicago	26.00
J. B. Olech, Chicago	25.00
Burne O. Sippy, Chicago	16.67
Frederick B. Noyes, Chicago	16.66
Edmund Noyes, Chicago	16.67
Bohemian Dental Society	15.00
Josephine D. Pfeifer, Chicago	11.00
Frank E. Cheeseman, Chicago	10.00
L. T. Megaw, Chicago	10.00
G. E. Silverling, Chicago	10.00
E. Mary Lohman, Chicago	10.00
Hart J. Goslee, Chicago	10.00
James Prothero, Chicago	10.00
David Barmack, Chicago	10.00
William Devlin, Chicago	10.00
H. L. Frankel, Chicago	10.00
F. H. Skinner, Chicago	10.00
L. E. Jelinek, Chicago	10.00
I. Drozdowitz, Chicago	5.00
A. A. Cowin, Chicago	5.00
J. L. Ginsberg, Chicago	5.00
N. Kimmel, Chicago	5.00
Louis Miller, Chicago	5.00
M. H. Lewin, Chicago	5.00
D. S. Singer, Chicago	5.00
C. H. Dodge, Chicago	5.00
S. W. Fahrney, Chicago	5.00
Hugo Franz, Chicago	5.00
A. B. Berkensteadt, Chicago	5.00
W. E. Fribley, Chicago	5.00
Charles E. Meerhoff, Chicago	5.00
James C. Miller, Chicago	5.00
George W. Pitts, Chicago	5.00
James Snow, Chicago	5.00
Mark W. Trude, Chicago	5.00
L. G. White, Chicago	5.00
F. C. Perl, Chicago	5.00
E. P. Boulger, Chicago	5.00
H. L. Brown, Chicago	5.00
F. G. Conklin, Chicago	5.00
H. A. Frankel, Chicago	5.00
H. O. Hansen, Chicago	5.00
F. T. Hays, Chicago	5.00
H. C. Lee, Chicago	5.00
F. J. Ryan, Chicago	5.00
D. W. Adams, Chicago	5.00
Emil L. Aison, Chicago	5.00
Walter C. Ball, Chicago	5.00

M. E. Bellows, Chicago	5.00
M. D. K. Bremner, Chicago	5.00
Lionel N. Drues, Chicago	5.00
J. B. Medina, Chicago	5.00
S. E. Ofner, Chicago	5.00
A. B. Pooley, Chicago	5.00
E. O. Smedberg, Chicago	5.00
Lewis T. Weinshenker, Chicago	5.00
M. L. Aren, Chicago	5.00
M. M. Block, Chicago	5.00
J. G. Cannon, Chicago	5.00
H. A. Honoroff, Chicago	5.00
Alfred Kamin, Chicago	5.00
William Kamin, Chicago	5.00
N. Z. Feldsher, Chicago	5.00
A. L. Schloss, Chicago	5.00
George G. Knapp, Chicago	5.00
A. W. Blim, Chicago	5.00
Lester Clow, Chicago	5.00
L. L. Davis, Chicago	5.00
James Ford, Chicago	5.00
L. S. Huhn, Chicago	5.00
J. S. McLaren, Chicago	5.00
Harry Pinney, Chicago	5.00
Joseph G. Wiedder, Chicago	5.00
Peter Wumkes, Chicago	5.00
C. T. Brady, Chicago	5.00
F. J. Bernard, Chicago	5.00
L. J. Fels, Chicago	5.00
S. L. Friedman, Chicago	5.00
C. R. Kuderling, Chicago	5.00
J. H. Kaplan, Chicago	5.00
N. L. Kettlewell, Chicago	5.00
E. Maginnis, Chicago	5.00
E. H. Morhnam, Chicago	5.00
F. B. Rhobotham, Chicago	5.00
A. Rodosy, Chicago	5.00
J. G. Rosen, Chicago	5.00
J. C. Yates, Chicago	5.00
A. T. Williams, Chicago	5.00
Joseph A. Dunn, Chicago	4.00
A. J. Agranat, Chicago	3.00
A. M. Schoenbrod, Chicago	3.00
H. Reiseman, Chicago	3.00
D. J. Ratner, Chicago	2.50
Carl D. Bates, Chicago	2.00
Arthur I. Porges, Chicago	2.00
J. A. Atchison, Chicago	2.00
L. Barcroft, Chicago	1.00

J. R. W. Cook, Chicago	1.00		
G. R. Olfson, Chicago	1.00		
R. R. Rains, Chicago	1.00		
G. O. Vennesland, Chicago	1.00		
E. Hahn, Chicago	1.00		
		$1,586.50	
Eastern Illinois Dental Society		50.00	
LaSalle County Dental Society		32.00	
Sangamo-Menard County Society, Ill.		150.00	
			$1,868.50
Indiana State Dental Society			
Hammond, Indiana dentists:		$ 50.00	$ 50.00
R. R. Gillis, Hammond			
J. W. Acton, Hammond			
S. A. Bell, Hammond			
E. A. Bock, Hammond			
J. R. Brown, Hammond			
F. W. Carter, Hammond			
H. W. Cawley, Hammond			
W. H. Davis, Hammond			
E. A. Frantz, Hammond			
H. E. Ferenbacher, Hammond			
R. F. Holley, Hammond			
M. H. Iddings, Hammond			
A. L. Hickman, Hammond			
M. Kelley, Hammond			
A. R. McConnell, Hammond			
L. J. Moran, Hammond			
Carl F. Morganthaler, Hammond			
W. J. O'Keefe, Hammond			
S. Paul Richards, Hammond			
G. L. Smith, Hammond			
Marion F. Sullivan, Hammond			
W. E. Spitler, Hammond			
A. J. Warber, Hammond			
Lena B. Watson, Hammond			
Minnesota State Dental Society			
E. D. Bettenhausen, Duluth, Minn.		$ 15.00	$ 15.00
New York State Dental Society			
First District Dental Society, New York		500.00	
Philip Nemoff, West New York, N. Y.		5.00	505.00
North Carolina State Dental Society			
North Carolina State Dental Society		300.00	300.00
Ohio State Dental Society			
Cleveland Dental Society		500.00	500.00

TEXAS STATE DENTAL SOCIETY		
Fort Worth Dental Society	50.00	50.00
WISCONSIN STATE DENTAL SOCIETY		
W. L. Dunkirk, Union Grove, Wisconsin	5.00	5.00
Total		$3,493.50
Total State Societies		$3,493.50
Contributions paid direct to Dr. Floristan Aguilar, Madrid, Spain:		
American Dental Association, Chicago, Ill.	$2,500.00	
Otto U. King, Chicago, Ill.	104.00	2,604.00
Grand Total, November 19, 1923		$6,097.50

JAPANESE RELIEF CONTRIBUTIONS

CASH RECEIPTS

Henry G. Dressel, Chicago, Ill.	$10.00	
C. N. Johnson, Chicago, Ill.	50.00	
Otto U. King, Chicago, Ill.	50.00	
M. C. Stalland, St. Paul, Minn.	5.00	
Irwin G. Jirka, Chicago	5.00	
A. M. Bradley, Muskogee, Okla.	5.00	
A. T. Tornhom, Wausa, Nebr.	5.00	
William H. Leak, New York, N. Y.	5.00	$135.00

DENTAL INSTRUMENTS AND SUPPLIES

O. E. Parker, Delano, Ill.
Fred J. Staehle, Chicago, Ill.
D. S. Sterrett, Erie, Pa.
William H. Leak, New York, N. Y.
I. A. Eppstein, Toledo, O.
R. Q. Mills, Rochester, N. Y.

Medical and Dental News

FOREIGN

Dental Students: Soon he will see that it is insufficient to know how a thing should be done,—he must learn how to do it, by endless repetition, often wearisome and involving sacrifice of leisure, but essential if he would be a skillful operator—a professional expert and not merely a talented amateur—a qualified professional man in the widest meaning of the words, and not merely a person who has passed an examination. Therein is this reward—his profession becomes to him of intrinsic value, as an end in itself and not merely as providing him with means to follow other hobbies and pursuits.—The British Dental Journal, August 15, 1923.

Annual Report of the Museum of the Royal College of Surgeons: The Annual Report of the Museum of the Royal College of Surgeons by the conservator, Sir Arthur Keith, shows that this famous institution steadily progresses and enlarges its scope. Though odontology is but one of the many subjects represented in the Museum, yet it is probable that it contains perhaps the best collection of odontological specimen in the world. In this respect the Museum owes much to the energy of Sir Frank Colyer, who is the honorary curator of the odontological section, which includes the museum of the old Odontological Society transferred to Lincoln's Inn Fields when the Society became part of the Royal Society of Medicine. We learn that the catalogue of the odontological collection has now been completed with exception of the division dealing with irregularities of the teeth. Among the additions to the series of specimen of human osteology is a cast of a tooth presented by the American Museum of Natural History, which is held by Dr. H. F. Osborn to indicate the existence of a human genus, named Hesperopithecus, living in North America during the Pliocene period. Opinion on this tooth is not unanimous, for some observers regard it as the worn molar of a Pliocene bear.—British Dental Journal, August 15, 1923.

GENERAL

Dentistry and the Cancer Problem: The editor asks, "What can the dental profession do in helping to stamp out cancer?" Cancer of the mouth and tongue is common in men and hence is usually associated with the habit of smoking. The cigarette has not been accused as a rule but Bloodgood has pointed out that by the sticking of the paper to the lip a focus of irritation may be started up. Recently surgeons familiar with cancer have addressed dental societies as to the function of the dentist in suppressing cancer. While little that is new was brought out, the responsibility of the dentists to their patients was shown to be heavy. Not only the epithelioma of the buccal cavity but sarcomas of the bones may first be seen by him. The dentist may for the moment liken the man who wanders into his office with incipient cancer to a man in the first stage of smallpox. He should feel the same responsibility toward sending him where he will be taken care of. In a specimen case a man presented himself at the office of his dentist for an extraction. The dentist noticed an ulcer on the tongue which the patient had been told was a diabetic sore. This diagnosis, it seems, was confirmed later by another general practitioner but later the ulcer developed a profuse hemorrhage and the surgeon who arrested it found that the tongue was cancerous and excised half of the organ.—Editorial in The Dental Outlook, August, 1923.

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Dental Association, November 10, 11, 12, 13, 14, 1924, Dallas, Texas.

American Society of Dental Radiographers, January 15 and 16, 1924, Chicago, Illinois.

STATE SOCIETIES

National Capital, first Tuesday of every month.

January (1924)

Chicago Dental Society, at Chicago, (17, 18, 19).

February (1924)

Marquette University Dental Alumni Association, at Milwaukee, Wisconsin (20, 21, 22).

April (1924)

Virginia, at Norfolk (28, 29, 30).
Kentucky, at Louisville (7, 8, 9, 10).
New Jersey (8, 9, 10, 11).
North Carolina, at Raleigh (21, 22, 23).

May (1924)

Pennsylvania, at Pittsburgh (13, 14, 15).
Tennessee, at Chattanooga (5, 6, 7).
Dental Society of the State of New York, at Binghamton (7, 8, 9, 10).

MEETINGS OF STATE BOARD OF DENTAL EXAMINERS

Delaware, at Wilmington, January 16 and 17. Secretary, W. S. P. Combs, Middletown, Delaware.

Minnesota, at University of Minnesota College of Dentistry, Minneapolis, December 10 to 15. Secretary, R. B. Wilson, 1133 Lowry Bldg., St. Paul, Minnesota.

Nevada, at Reno, January 7. Secretary, G. H. Marven, Reno, Nevada.

North Carolina, at Greensboro, January 7. Secretary, F. L. Hunt, Asheville, North Carolina.

North Dakota, at Fargo, January 8 to 11. Secretary, Solon Crum, Fargo, North Dakota.

Oklahoma, at Oklahoma City, December 17 to 21. Secretary, L. M. Doss, 248 American National Bank Bldg., Oklahoma City, Oklahoma.

South Dakota, at Sioux Falls, January 7. Secretary, L. R. Walston, Redfield, South Dakota.

Texas, at Houston, December 10 to 13. Secretary, R. L. Rogers, Amarillo, Texas.

THE DENTAL SOCIETY OF THE STATE OF NEW YORK

The fifty-sixth annual meeting of the Dental Society of the State of New York will be held at Kalurah Temple, Binghamton, New York, May 7, 8, 9, and 10, 1924. A cordial invitation is extended to all ethical practitioners, resident of New York and sister states. Admission to all literary meetings and clinics will be secured by presentation of cards disclosing membership in State and National Association Societies. All literary exercises, clinics and exhibits will be staged at Kalurah Temple.

The executive council for the transaction of business will convene Tuesday, May 6, at 3 P. M.

The exhibits will be in charge of the Exhibits Committee, Thomas R. Cullen, Chairman, Oswego, New York. Exhibitors please address Dr. Cullen for further information. Exhibitors desiring space should secure same without delay.

Every effort is being put forth to make the fifty-sixth meeting in all respects the most attractive in the history of the Society.

Hotel reservations should be made direct with the hotel management. Headquarters, Hotel Arlington.

For further information and programs, address,

A. P. BURKHART, *Secretary*,
89 Genesee St., Auburn, N. Y.

SIXTIETH ANNUAL MEETING OF THE CHICAGO DENTAL SOCIETY

JANUARY 17, 18 AND 19, 1924—THE DRAKE HOTEL

The Chicago Dental Society sends greetings and extends a most cordial invitation to all members of the American Dental Association to attend the sixtieth annual meeting and clinic, January 17, 18 and 19, 1924. Wives of the visiting dentists are especially welcome and entertainment will be provided for them.

The program is being prepared with special reference to the vital subject of Community Dental Service" and to the basic fundamental "Diagnosis," which is of such paramount importance in every dental operation. Half-day Lecture Clinics, Group Clinics, Individual Clinics and Exhibits are being selected to cover the entire field of dentistry and complete a well-balanced program. The dental manufacturers and dealers will, as usual, present a large number of interesting exhibits.

Railroad Rates Reduced

All members of the American Dental Association wishing to visit the January meeting of the Chicago Dental Society may secure Railroad rates of one and one-half (1½) fare by paying the regular one way fare and getting a certificate at the same time. This reduced rate will apply where the one way fare is over sixty-seven cents (67c) and if more than two hundred and fifty (250) members, their wives and dependents, have their certificates validated at the meeting.

TENTATIVE PROGRAM

THURSDAY, JANUARY 17, 1924

Half-day Lecture Clinics

Gold Inlays.
R. H. Volland, Iowa City, Iowa
Full Denture Construction.
R. R. Gillis, Hammond, Indiana
Conductive Anesthesia.
Ralston I. Lewis, Chicago
Diagnosis.
Louis Schulz, Chicago
Partial Dentures.
Polk Akers, Chicago
Porcelain Crowns.
Theodore B. Kurtz, Chicago
Loren D. Sayre, Chicago
Root-Canal Problems.
Edgar D. Coolidge, Chicago
Radiography.
James H. Prothero, Chicago
Blood Chemistry.
John L. Kendall, Chicago
Periodontal Membrane.
Fred W. Merrifield, Chicago
Problems.
G. R. Lundquist, Chicago
Report of Studies in Casting.
M. S. Sorley, Chicago
Studies in Pathology of the Investing Tissues of the Teeth.
Edward H. Hatton, Chicago
William G. Skillen, Chicago
Emil G. Mueller, Chicago
Diagnosis.
William H. G. Logan, Chicago
Full Denture Construction.
R. Schlosser, Chicago
Gold Inlays.
A. P. Grunn, Chicago
Traumatic Occlusion.
Austin F. James, Chicago
Diagnosis.
Herbert A. Potts, Chicago
Periodic Treatment of Malocclusion.
B. E. Sippy, Chicago
Porcelain Crowns.
Stanley D. Tylman, Chicago
M. G. Kral, Chicago
Root-Canal Problems.
J. R. Blayney, Chicago
Dietetics.
Arthur G. Loomis, Chicago
Radiography.
Fred F. Molt, Chicago
Anesthesia—Study Club.
Carroll W. Stuart, Chicago
Chayes' Movable Removable Bridgework.
Thomas P. Rose, Chicago

THURSDAY EVENING, JANUARY 17, 1924

The annual banquet will as usual be the climax of the social activities of the Chicago Dental Society. A splendid dinner will be served and there will be a few brief speeches together with some high-class entertainment. The guest of honor will be announced later

FRIDAY MORNING, JANUARY 18, 1924

GENERAL SESSION

SYMPOSIUM ON DIAGNOSIS

Normal and Abnormal Development.	B. E. Lischer, St. Louis, Mo.
Oral Diagnosis.	Haidee Weeks Guthrie, New Orleans, La.
What Teeth Should be Extracted?	Thomas L. Gilmer, Chicago

FRIDAY AFTERNOON, JANUARY 18, 1924

HALF-DAY LECTURE CLINICS

Management of proximal Cavities in Front Teeth.
Charles E. Woodbury, Council Bluffs, Iowa

Partial Dentures.
W. I. McNeill, Chicago

Gold Inlays.
Victor T. Nylander, Chicago

Fractures of Jaws.
Ralph Fouser, Chicago

Diagnosis.
Earle H. Thomas, Chicago

Fixed Bridgework.
R. E. MacBoyle, Chicago

Children's Dentistry.
Phillip R. Thomas, Minneapolis, Minn.

Casting.
Charles F. Franzwa, Milwaukee, Wis.

Gold Foil Clinics. Dr. C. E. Woodbury's Unit.
H. A. True, Des Moines, Iowa
John H. Davis, Sioux City, Iowa
F. W. Schaefer, Omaha, Nebraska

Evidences of the Relation Between Dental Foci, and Systemic Disease.
John G. Meisser, Mayo Clinic, Rochester, Minn.

Pathology of Periodontal Membrane.
Frederick Bogue Noyes, Chicago

Exhibit by Public Service Committee of Chicago Dental Society.

FRIDAY EVENING, JANUARY 18, 1924

GENERAL SESSION

COMMUNITY DENTAL SERVICE[1]

Community Dental Service.	Michael M. Davis, Jr., New York City
Chicago's Problem in Community Dental Service.	Arthur D. Black, Chicago

SATURDAY MORNING, JANUARY 19, 1924

CLINICS—GROUP AND INDIVIDUAL

The following highly developed unit clinics will be presented by groups of members of the Seven Branches of the Chicago Dental Society, who have worked and studied together as Clinic Clubs and will endeavor to illustrate in a practical manner a few important facts related to their subjects.

North Suburban Branch—I. A. Smothers, Chairman.

Subject—"Prevention."

Under the general title of Prevention, this clinic will attempt to demonstrate Prevention as related to:

First, Caries; second, Gingivitis and its sequelae; third, Apical infection; fourth, Malocclusion; fifth, Malignant growths.

Models and charts will be used to illustrate the several subjects under consideration.

[1]Members of the Medical Profession, Health Department, Welfare Workers and interested individuals are cordially invited to this Session.

North Side Branch—F. B. Rhobotham, Chairman.

Subject—"Children's Dentistry."

1. Diagnostic findings in children's mouths as symptoms of systemic disorders, and focal infections in the mouths of children as responsible factors in metastatic disturbances. 2. The value of radiograms in early diagnosis as a means of preventing malocclusions as their sequalae.

West Suburban Branch—A. W. Campbell, Chairman.

Subject—"Local Anesthesia."

This clinic will be given as a progressive symposium covering the entire field of local anesthesia, and embracing the various anesthetic agents, as, cocain, novocain, butyn, etc. Preparation of solutions, surface anatomical landmarks, distribution of the various branches and sub-branches of the fifth nerve, as relates to the teeth and their supporting structures. Standardized technic of sterilization of instruments and equipment. Technic of injecting for cavity preparation, pulp removal, exodontia and minor surgery.

Kenwood-Hyde Park Branch—Lucien H. Arnold, Chairman.

Subject—"Root-Canal Management."

Classification of canal conditions; systemic effects on canal conditions; medicaments used; filling materials used; special instruments used; sterilization of canals, materials, instruments, hands, etc.; treatment of canals containing some live pulp tissue; treatment of canals containing putrescent material; pulp destruction; infiltration theory; "fat dams" in tubules; canal lubricants; solid filling after lubrication; radiographing; correcting imperfections.

West Side Branch—E. C. Boulger, Chairman.

Subject—"Conservation."

Conservation of tooth structure as applied to fixed bridgework without jeopardy to the health of the patient.

The radical viewpoint entertained in regard to pulpless teeth has gradually resolved itself into the alternative, the conservation of tooth structure. Proper clinical and radiographic diagnosis is essential before the decision of retention or loss of a tooth. Patients suffering from systemic troubles and those susceptible to apical involvement of pulpless teeth as disclosed by the radiogram when root-canal fillings have been made and failed, are poor risks for future treatment.

The removal of a vital pulp for the sole purpose of preparing an abutment for a fixed restoration has gradually become passé and in the light of our present knowledge, fitting attachments for such cases has been developed to preserve the vitality of the pulp. This clinic will endeavor to demonstrate where one is justified in extraction and how abutments may be made on vital teeth to conserve the pulp thereof.

Englewood Branch—Frederick F. Molt, Chairman.

Subject—"Oral Radiography."

This clinic will be essentially a short course in oral radiography leading up to the production of the interpretable type of radiogram which will permit of intelligent interpretation. While without doubt many fail in interpretation because of lack of preliminary knowledge on this subject—a fault that the lecture clinics aim to correct—many others go astray because of the distortions, over exposure, under exposure or faulty development procedure, all of which errors will be covered as thoroughly as the time will permit.

Northwest Side Branch—O. J. Olafsson, Chairman.

Subject—"Amalgam Technic."

1. Cavity preparation, with special reference to treatment of occlusal surfaces; 2. Matrix Forms; 3. The Proper Mixing of Ingredients; 4. Correct Application of Pressure in Packing; 5. Condensation of Fillings and Expressing Mercury; 6. Carving and Finishing.

Other Group Clinics, as well as individual presentations, will be given which will cover practically everything in dentistry and round out a well-balanced program.

DENTAL SCHOOLS AND HOSPITALS

There will be, as usual, Surgical Clinics at the several Dental Schools and Hospitals. Automobiles will be used to take the members desiring to see these Clinics.

MANUFACTURERS' EXHIBITS

On Thursday and Friday, the following hours have been set aside for visits to the exhibits of the Dental Dealers and Manufacturers, where one may see the very newest and best in equipment and supplies: 11:30 A. M. to 2:30 P. M., and 4:30 to 5:30 P. M.

NEW JERSEY STATE DENTAL SOCIETY

The next annual meeting of the New Jersey State Dental Society, will be held April 8, 9, 10 and 11, 1924, at Trenton, New Jersey.

NORTH CAROLINA DENTAL SOCIETY

The fiftieth annual meeting of the North Carolina Dental Society will be held at Raleigh, North Carolina, April 21, 22 and 23, 1924. Headquarters, Sir Walter Hotel.

H. O. LINEBERGER, *Secretary*,
Raleigh, North Carolina.

DELAWARE BOARD OF EXAMINERS

The next meeting of the Delaware Board of Dental Examiners will be held in the Municipal Building, 10th and King Streets, Wilmington, January 16 and 17, 1924, 9 a. m. to 5 p. m.

W. S. P. COMBS, *Secretary*,
Middletown, Delaware.

NORTH DAKOTA STATE BOARD

The North Dakota State Board of Dental Examiners will hold a semi-annual examination on January 8 to 11, 1924, at Fargo, North Dakota. All applications for this examination should be filed with the Secretary ten days before the date of said examination.

SOLON CRUM, *Secretary*,
Fargo, North Dakota.

SOUTH DAKOTA STATE BOARD

The South Dakota State Board of Dental Examiners will hold their next examination at Sioux Falls, South Dakota commencing Monday, January 7 at one P. M. For further information and applications, write

L. R. WALSTON, D.D.S.,
Redfield, South Dakota.

AMERICAN SOCIETY OF DENTAL RADIOGRAPHERS

The midwinter meeting of the American Society of Dental Radiographers will be held at the Drake Hotel, Chicago, Illinois, Tuesday and Wednesday, January 15 and 16, 1924. The program committee is arranging an exceptionally good program.

ARNOT A. MOORE, *President*,
131 Allen St., Buffalo, N. Y.
MARTIN DEWY, *Secretary-Treasurer*
501 Fifth Avenue, New York, N. Y.

REGISTRATION BUREAU FOR DENTISTS AND HYGIENISTS

The Dental Hygienists' Association of the state of New York has organized a Registration Bureau for the convenience of dentists and hygienists. Dentists or institutions needing the service of dental hygienists are invited to communicate with the Registrar, Miss Edith Hardy, 35 Chestnut Street, Rochester, New York.

MARQUETTE UNIVERSITY ALUMNI

The eighteenth annual meeting and clinic of the Marquette University Dental Alumni Association will be held at the Auditorium, Milwaukee, Wisconsin, February 20, 21 and 22, 1924.

PSI OMEGA FRATERNITY BANQUET

The Chicago Alumni Chapter of Psi Omega Fraternity will celebrate its tenth anniversary by giving a banquet on Saturday evening, January 19, 1924, at the Drake Hotel. All visiting Psi Omegans attending the Chicago Dental Society meeting are invited to attend.

R. M. BONDY, D.D.S., *Secretary*,
153 W. 69th St., Chicago, Ill.

CLASSIFIED INDEX OF PERIODICAL DENTAL LITERATURE COVERING THE PERIOD FROM 1839 TO 1875

This is the most important volume of the series of Indexes as it covers the development of the dental profession from the time of the organization of our first dental college and the publication of our first dental journal up to the time when dentistry had become definitely established as a branch of the Healing Art. It gives the record of the work of that group of men who were the pioneers in the development of dentistry, and whose work and writings should be familiar to all who enter practice in the future.

Many articles published during the period covered by this Index laid the foundation for the development of our progress along almost every line of procedure, and it is doubtful if anyone is justified in preparing a paper today without reviewing some of the articles written during the period covered by this Index, and giving credit to the men of that day. In other words, this volume of the Index gives opportunity for the teacher and the writer to obtain a proper background for every subject upon which he might lecture or write.

Every dental periodical published in the

English language during the thirty-seven years covered by the Index has been reviewed, and all of the articles have been classified. The more important of the journals are now available in dental libraries in all of the larger cities of the country, and in practically all dental schools. In addition there is being developed an abstract service which will make it possible for a dentist, even though located in the smallest town or the most remote region, to secure abstracts of articles on any subject for a nominal fee.

The Index is published by the Dental Index Bureau under the auspices of the American Institute of Dental Teachers, and is obtainable from the Secretary, Dr. Abram Hoffman, 381 Linwood Avenue, Buffalo, New York. It will be sent postage prepaid on receipt of $6.00 to points within the United States and Canada, all other points prepaid $6.50. The Index may also be ordered from Henry Kimpton, 263 High Holborn, London, England.

NEW BOOKS RECEIVED FOR THE LIBRARY OF THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

The Journal of the American Dental Association promptly acknowledges herewith the receipt of new publications. Books selected from those named on this list are reviewed below. Reviews are matter-of-fact statements of the nature and contents of the publication referred to and are intended *solely to guide possible purchasers.*

Brophy. "Cleft Lip and Palate." 466 illustrations and a number of colored plates. Cloth, $6.00. By Truman W. Brophy, M.D., D.D.S., SC.D., President and Professor of Oral Surgery, Chicago College of Dental Surgery. Published by P. Blakiston's Son & Co., 1012 Walnut Street, Philadelphia, Pa.

Medical Department of the United States Army in the World War. Volume 1. Prepared under the Direction of Maj. Gen. M. W. Ireland, M.D., Surgeon General of the Army by Col. Charles Lynch, M.C., Lieut. Col. Frank W. Weed, M.C., Loy McAfee, A.M., M.D. Surgeon General's Office, Washington, D. C.

Broomell and Fischelis' "Anatomy and Histology of the Mouth and Teeth," 6th edition, revised, with 362 illustrations. 8vo. XIII—461 pages. Cloth $5.00. By I. Norman Broomell, D.D.S., Dean, Temple University Dental School, Philadelphia, and Philipp Fischelis, M.D., Professor of Histology and Embryology, Temple University Dental School, Philadelphia. Published by P. Blakiston's Son & Co., 1012 Walnut Street, Philadelphia.

A FEW OF THE NEW VIEWPOINTS OF DENTAL PATHOLOGY

Abstracted from volumes by Weston A. Price on "Dental Infections, Oral and Systemic" and "Dental Infections and the Degenerative Diseases." Published by The Penton Publishing Company, Cleveland.

(a) In the consideration of dental focal infections in the past, much emphasis has been put on the biological strain of organism which has chanced to get access to that focus. The extent and nature of the local and systemic reactions have been looked upon as largely functions of that invading organism. The author submits evidence for consideration, which suggests to him that the organisms, which are chiefly involved in dental infections: namely, streptococci, obtain their elective localization qualities, when such exist, very largely from the host, which furnishes to them their nutriment and environment, and that they do this largely through their wonderful capacity for adaptation.

(b) With regard to root end infections, the current and general conception seems to be that the extent of an area of absorption about the apex of an infected tooth root, when such exists, is directly a measure of the quantity of that infection and therefore a measure of the danger. The author believes this to be a misapprehension and misinterpretation. The new data indicate to him that it does not represent the activity of the invading organism but does express the reactivity of the invaded host to that foreign irritant, the invading organism.

(c) The presumption in current dental diagnosis seems, in general, to be that potentially equivalent, infected teeth will, in different individuals, be attended by similar local expressions about those infected teeth. The data developed in his researches indicate to him that potentially equivalent, infected teeth will, in different individuals, be attended by very different types of local structural changes in the supporting tissues.

(d) It is currently understood, he believes, that the safety of the host is inversely proportional to the evidence of reaction about infected teeth. For example, it is presumed that those teeth with large areas of rarefaction about their apices indicate that those patients are potentially in danger because of a large amount of infection, and those with little or no evidence of reaction about the teeth are in relatively little danger. The data, which he presents to you, clearly indicate to him that with a given dental infection the safety of the host is directly proportional to his capacity for local reaction; and, conversely, his danger is in direct proportion to

his lack of capacity to make a local reaction. With a given infected tooth, therefore, a vigorous local reaction means, incidentally, a liberal destruction of bone for the development of an affective defensive quarantine tissue immediately about the source of that infection. He believes that it is at the time that this quarantine tissue ceases to function and breaks down, that the host comes to be in danger, for now the warfare, which up to this time has been waged to a finish immediately about the infected tooth, must be waged in other structures of the body, and that tissue tends to break first, which is most weakened by overload or handicapped by lack of inherited defensive forces.

(e) It may be that with this given infected tooth, the patient may be one who never established an adequate local quarantine, and he never was safe and therefore never established a zone of rarefaction about the tooth, or if any, a very slight and inadequate one. The factor of safety of this type of person is being grossly misjudged, and often those individuals most needing rescue are mistakenly dismissed as having no source of serious focal infection.

(f) Decalcification and calcification processes, as reactions to irritants, have direct significance because they are a fundamental part of the defensive reactions.

(g) The various expressions of different types of reaction, local and systemic, are directly related to fundamental factors of blood chemistry, blood morphology, and blood bactericidal property, for certain types of organisms, chiefly the strains of streptococci and diplococci.

(h) The decreased defensive forces of the blood can often be enhanced, and in some cases very greatly so.

(i) A long continued, or chronic, dental infection, which may have given no suggestions of tenderness, may (because of the absence of a local warfare and defensive fight) cause the breakdown of certain organs or tissues of the body, though it may take months or years to do it, during which time the tooth involved may never even be suspected.

(j) Thus, very many of the degenerative, or so-called old age diseases may have as their contributing or as their principal causative factor, such an obscure dental focal infection, with or without local or systemic contributing overloads. These degenerative processes may include various types of eye involvements, including blindness, heart involvements of many types, several types of kidney disease, mild and grave nervous system and brain diseases, many digestive tract diseases, ovarian cysts, a large percentage of the cases of arthritis, many types of skin lesions, several of the allergic disturbances, etc., etc. He believes that he has demonstrated that almost any structure of the body may be involved and many pathological states, which have not been considered to have even a remote relation to focal infection, are now demonstrated to be influenced by them.

PATENTS OF INTEREST TO DENTISTS

1402396. Therapeutic vapor-lamp appliance, Fred F. Burdick and F. A. Anderson, Milton, Wisconsin.

1402225. Dental apparatus, Charles F. Garretson, Knoxville, Iowa.

1402229. Nerve extracting needle for dental purposes or the like, Friedrich Hauptmeyer, Essen, Germany.

1402292. Dental chair, George D. Heck, Prince Bay, New York.

1402298. Dental tray, Wm. N. Kidder, Cranston, Rhode Island.

1402525. Dental instrument, Jennie S. Moseler, Chicago, Illinois.

1402011. Hypodermic syringe, Abram L. Ostrov, Llandrindod Wells, Wales.

1402374. Electric therapeutic lamp, Antonio Papini, Philadelphia, Pa.

60184. Design, toothbrush handle, Wm. L. Webster, New York, New York.

1403297. Artificial teeth, Raphael A. De Rome, Chicago, Illinois.

1403020. Hypodermic syringe, Samuel J. Everett, Thornton Heath, England.

1403119. Therapeutic lamp, Paul E. Johnson, Chicago, Illinois.

15265. Reissue, Dental impression flask, Finis E. Roach, Chicago, Illinois.

1403347. Centrifugal casting machine, Albert F. Rockwell, Bristol, Conn.

1404008. Mouthpiece, Chester H. Burnham, North Andover, Massachusetts.

1403935. Apparatus for die-casting metals, Harriet Hill, New York, New York.

1404141. Toothbrush, Harry E. Rice, Jr., Springfield, Ohio.

1404164. Display holder, Robert M. Robinson, Columbus, Missouri, and H. M. McDonald, Hartford, Connecticut.

1404519. Dental broach holder, James M Gilbert, Dallas, Texas.

1404316. Artificial tooth, Russel J. Park St. Louis, Missouri.

1405279. Toothbrush, Wm. M. Cassedy, Cape May, New Jersey.

1405217. Dental film holder, Wm. O. Houser, Lincoln, Illinois.

1404789. Syringe, Callie E. Morris, Brooklyn, New York.

1405353. Dental surgical instrument, James H. Taylor, Owensboro, Kentucky.

1405354. Dental surgical instrument, James H. Taylor, Owensboro, Kentucky.

1405361. Attachment for collapsible tubes, John S. Turner, New Brunswick, New Jersey.

1405249. Dental tool, Luther A. Young, University, Missouri.

1406143. Dental instrument holder, Thomas F. Bates, Shelbyville, Tennessee.

1405689. Tongue guard, Timothy O. Heatwole, Baltimore, Maryland.

1405874. Connecting the backing and facing of a tooth, Lake H. Sprinkle, Brooklyn, New York.

60340. Design, Tray for holding dental instruments and supplies, Garrett L. Grier, Milford, Delaware.

1406373. Clinical thermometer holder, James T. Greely, Nashau, New Hampshire.

1406263. Angle plate and handle for dentist's boring machines, Paul Kuhn, Leipzig-Stotteritz, Germany.

1406492. Dental impression tray, Vincent M. Robinson, St. Joseph, Missouri.

1407347. Combined tumbler, toothbrush, and tube-paste holder, Charles H. Dempewolf, Oswego, New York.

1407557. Interchangeable tooth, Robert J. McVicker, New York, New York.

1407214. Toothbrush, Leon Osborn, Zellwood, Florida.

1407484. Making artificial teeth, Joseph E. Rose, Portland, Oregon.

1407840. Dental parallel-cavity former, Henry L. Cruttenden, Northfield, Minnesota.

1408272. Automatic syringe filler, Webster J. Daly, Los Angeles, California.

1408194. Blowpipe, John Harris, Lakewood, Ohio.

1408197. Handpiece for dental instruments, George M. Hollenback, Lewiston, Montana.

1408006. Dental surgery, Lawrence A. Kiander, New York, New York.

1408222. Spotlight projector, Will R Porter, Prince Bay, New York.

1407774. Investment composition, Jose G. Saravia, San Salvador, Salvador.

1407956. Rotary toothbrush, John L. T. Sneed, Walters, Oklahoma.

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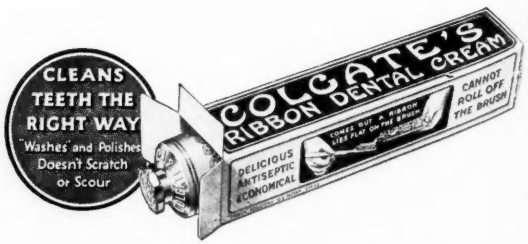

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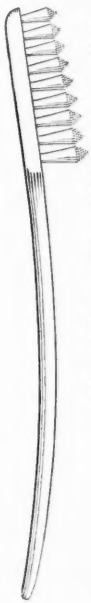

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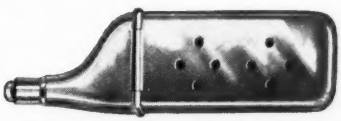

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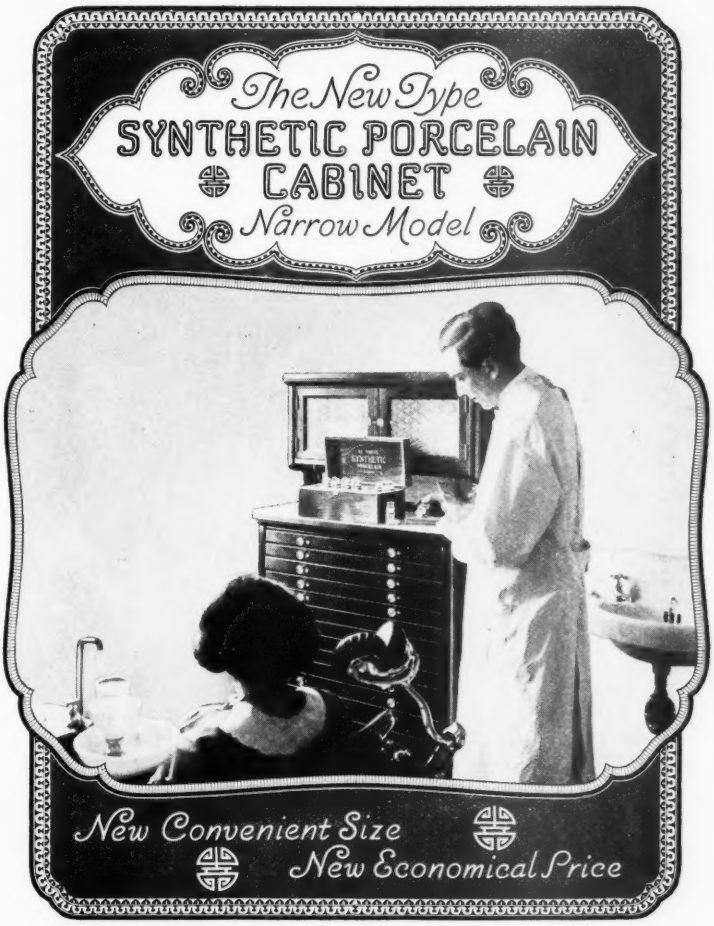

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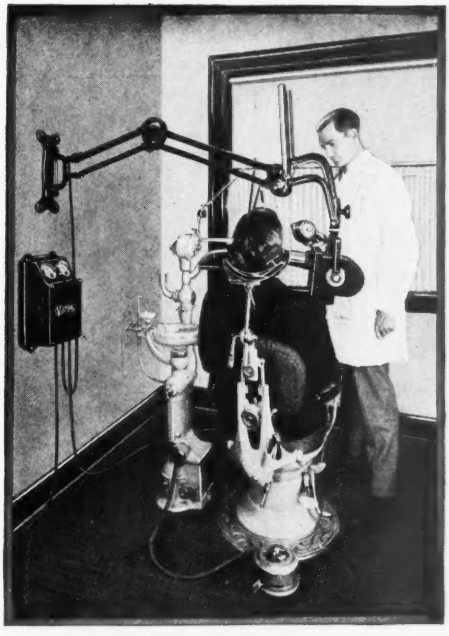

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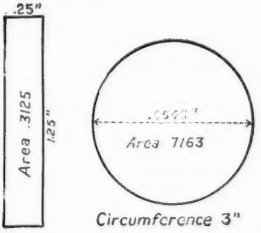

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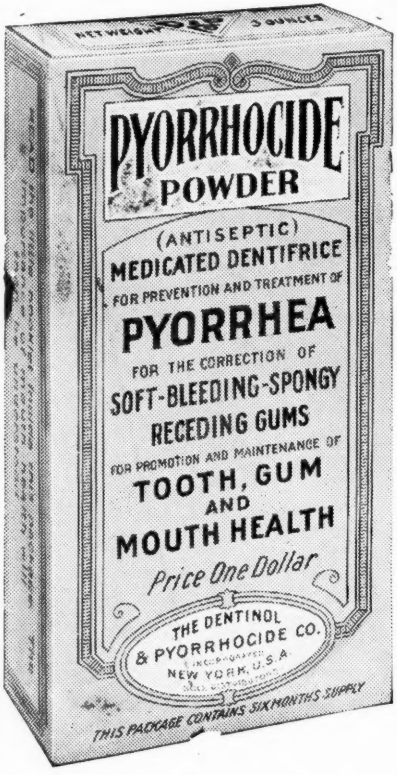

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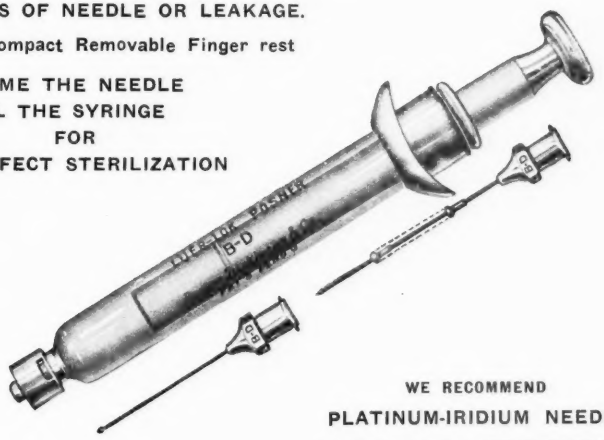

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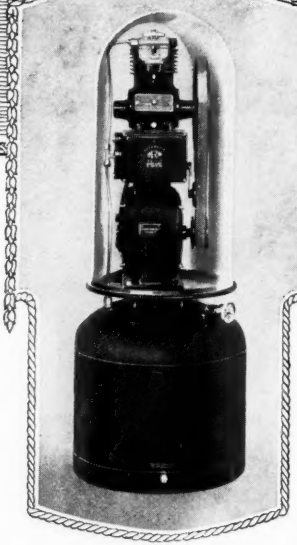
Parke, Davis & Company

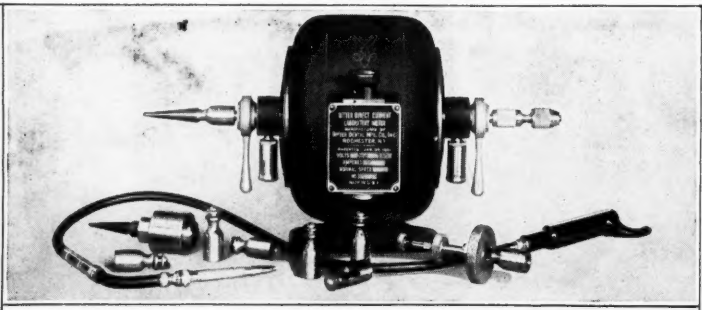
RITTER



Ritter Automatic Air Compressor designed with a double cylinder pump. It will produce the necessary tank pressure quicker and maintain it with the least attention of any dental air compressor made.

You can get years of continuous service *out* of Dental Equipment only when the manufacturer builds that kind of service *into* it.

Ritter Dental Mfg. Company, Inc.
Rochester, New York



Ritter Laboratory Lathe — designed for a *specific* purpose. Special construction makes it the most practical lathe for heavy, low speed grinding.

SMO-O-OO-O-O-TH

WHEN you draw the fine, smooth Clev-Dent Cement powder into the liquid, you'll say "S m ooooo t h." The powder fairly melts into the liquid, producing a mixture as smooth and free from grit as cream. There are no coarse or glass-like particles to prevent the accurate adaptation of your inlays.

Clev-Dent Cement is cool, too. It develops very little heat, even when the powder is added to the liquid rapidly. And it contains sufficient copper to produce continued sterilization.

Like all other Clev-Dent products, Clev-Dent Cement is sold at a discount of 25% from the retail price, for cash.

THE CLEVELAND DENTAL MFG. CO.
Post Office Box 414
Cleveland, Ohio, U.S.A.

TRADE CLEV-DENT MARK

Say: "I Saw it in THE JOURNAL"

The U. S. Army Bedside Unit

will take sinus as well as dental radiographs

Price, complete to operate
on A. C. $700.00
D. C. 800.00

Automatic Time
Footswitch .....
..... 30.00

Exceptionally complete and handy;

Makes a good appearance;

Has ample reserve power;

Will take a satisfactory radiograph of any part of the body;

Will operate from any houselighting service.

For further information apply to —

WAITE & BARTLETT MFG. CO.

53 Jackson Ave. Long Island City New York

Texas Representative -
Mr. Oliver Brush
708 Colorado St.
Austin

Some Questions

Dentists ask about Pepsodent

1—About acid

Pepsodent is mildly acid. Can such acidity offer possible harm?

It is found that peoples whose dietary consists largely of acid fruit, are notably less subject to caries. It is found that this mildly acid tooth paste, Pepsodent, increases the salivary flow, increases its alkaline index, and increases its ptyalin index as well.

It is found that mild acidity acts to disintegrate mucin plaque at all stages of formation.

To prove this acidity harmless, natural teeth have been immersed for four years in Pepsodent mixed with saliva without evidence of harm.

2—Lack of soap

Soap is alkaline. It cannot be used in a mildly acid tooth paste. Its effects on the saliva and on mucin plaques are the reverse of those produced by Pepsodent.

3—The polishing agent

The polishing agent in Pepsodent is a 50-50 mixture of calcium phosphate and calcium sulphate, finely powdered. It is far softer than enamel.

It is somewhat conspicuous, because the lubricating soap is absent. But it is harmless, as proved by many long and careful tests. Teeth have been brushed with Pepsodent up to 250,000 times without sign of harm to the enamel.

Right principles

Pepsodent embodies right principles, based on modern research. As a result, it is advised today by leading dentists the world over. It is used by careful people of some 50 nations, largely by dental advice.

It is opposed, of course, by advocates of theories now taboo. It is attacked, of course, by rivals. But we believe that any dentist who knows the facts will advocate and approve it.

Send the coupon for complete information, and for a tube to try. If you have any questions to ask concerning Pepsodent, we will be glad to answer them.

PAT. OFF.
Pepsodent
REG. U.S.

The Modern Dentifrice

1378

THE PEPSODENT COMPANY.
3305 Ludington Bldg., Chicago, Ill.

Please send me, free of charge, one regular 50c size tube of Pepsodent, with literature and formula.

Name .....

Address .....

Enclose card or letterhead

HALITOSIS

(AS DEFINED IN THE CENTURY DICTIONARY)

(Hal-i-to-sis) N. N. L.

(L. Halitus—Breath .:. Osis—Offensive)

Offensive breath, whether arising from diseased or neglected conditions of the teeth, mouth or nose or caused by disorders of digestion, respiration, the excessive use of tobacco, etc., may be readily overcome by the deodorizing properties of—

LISTERINE

Listerine is strictly antizymotic, it inhibits alike the acid fermentation of carbohydrates and the alkaline putrefactive processes of mixtures of meat and saliva, retained as debris about the teeth; hence, Listerine is antagonistic to the activating enzymes of fermentation so often the cause of Halitosis.

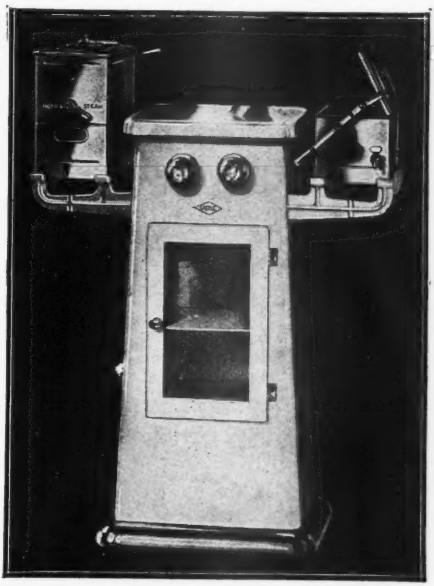
Many dental practitioners who advise their patients to use Listerine daily as a mouth-wash, also keep Listerine in an atomizer on the dental bracket readily available for use prior to operations, in self defense against pronounced cases of Halitosis.

Lambert Pharmacal Company

Twenty-first and Locust Streets **St. Louis, Mo., U. S. A.**

CASTLE

"Every patient looks for your sterilizer"



Your patients do know the difference

They know adequate sterilizing equipment, and they sense the lack of it.

If they see a steaming sterilizer as they go to the chair they are reassured.

If they fail to see one they wonder how you have cleaned the instruments you use in their work.

It pays to sterilize well, and publicly.

This new No. 1414-A is the best moderately priced equipment you can get. It gives you great convenience. See *it at your dealer's, and send for new complete catalog "I".*

Send me catalog "I" with details of the 1414-A

Dr. .....

.....

Dealer .....

CASTLE

Complete line of Dental, Physicians, Hospital and Bacteriological Sterilizers

WILMOT CASTLE COMPANY 1148 University Avenue, Rochester, N. Y.

American Cabinet No. 130

Up to the minute in every feature

American Dental Cabinet No. 130

A cabinet especially designed for the dentist who requires a high-grade cabinet that does not take up any unnecessary room.

It is compact, well-proportioned, and as well made and finished as our most expensive cabinets.

Equipped with white glass instrument trays, verde antique marble base, glass knobs, and vitrolite working surface, in fact it is a first class cabinet in every respect.

Size—Height 61⅝ in., depth 12 in., width 35 in.

Your Office Furniture reflects your personality, that is why it is so necessary that you purchase a cabinet that will do justice to your profession.

American Cabinets have always been known for their honest quality, fair prices, and up to the minute appearance.

If you have not our latest catalog of Dental Office Furniture, write for it.

The American Cabinet Co.

1313 - 18th St.

TWO RIVERS, WIS.

Wilk Peripheral Seal

Patents Allowed and Others Pending

Over - Compression, Atrophy, Rebasing, Pain

Most modern technics produce a terrifically tight denture which, through over-compression, causes atrophy of the peripheral tissues with subsequent loosening of the denture, which then requires rebasing—sometimes two or three times. Such a denture causes your patient pain and discomfort because of the vise-like grip of the hard vulcanite.

Wilk Peripheral Seal Eliminates Them All!

Over-compression, atrophy, rebasing, pain and discomfort are all eliminated and perfect retention is secured by the use of the Wilk Peripheral Seal, which is a specially molded, specially compounded soft rubber bead projecting slightly along the periphery of the tissue-bearing side of the denture. It is strong and durable, but, nevertheless, soft, velvety, yielding and non-irritant, its elastic properties completely sealing the periphery with the soft, velvety touch of a rubber glove. Try it on your next denture.

When supplied in new denture made by us, extra $2.50
When inserted in old denture, including new gum $4.00

***NOTE:* Price for insertion in old dentures does not cover reline, duplicate or reset**

Send the Coupon NOW!

Wilk DENTAL LABORATORY
"JUST A REAL GOOD LAB"
179 N. Michigan Boulevard
Dept. 1059, Chicago, Ill.

Wilk Dental Laboratory, Dept 1059,
179 N. Michigan Blvd., Chicago, Ill.

Please send me, without any obligation on my part, matter checked X in squares below.

[ ] Booklet about WILK Peripheral Seal.
[ ] Mailing box, labels, etc.
[ ] General Price List.

Name .....

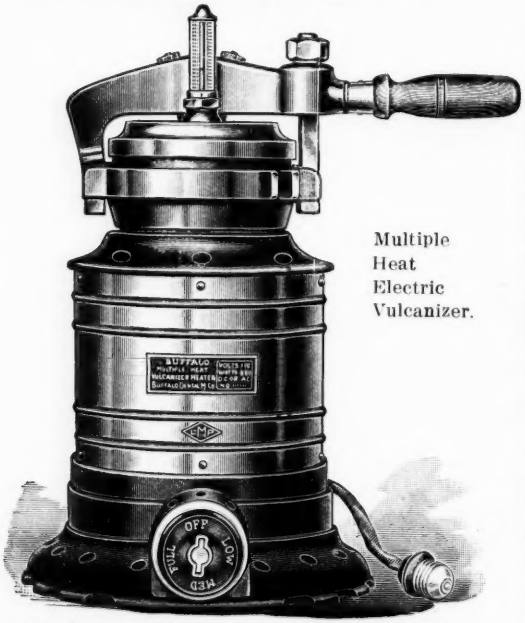
Street address .....

City and State .....

For A.C. 110 V. or 220 V. as illustrated.

Also adapted for D.C. 110 or 220 V. by addition of a relay switch.

Lewis Automatic Electric Vulcanizer.



Multiple Heat Electric Vulcanizer.

For A. C. or D. C. 110 or 220 Volt.

NEW VULCANIZERS

Modern Vulcanizers are operated by electric current.

The Lewis Automatic Electric, which is the latest type of Vulcanizing equipment is, perhaps, the most complete machine of its kind ever devised. It consists of a Cross Bar Vulcanizer of the regular standard type, fitted with an electrically operated heating apparatus and equipped with an electric control and time cut-off.

It is absolutely automatic in its operation, and requires no watching after the current is turned on.

The Multiple Heat is hand controlled, and requires some attention, but is far ahead of kerosene or alcohol heated Vulcanizers in point of accuracy and cleanliness.

These Vulcanizers are fully described in Booklet No. 2, a copy of which you should have.

Where shall we send it?

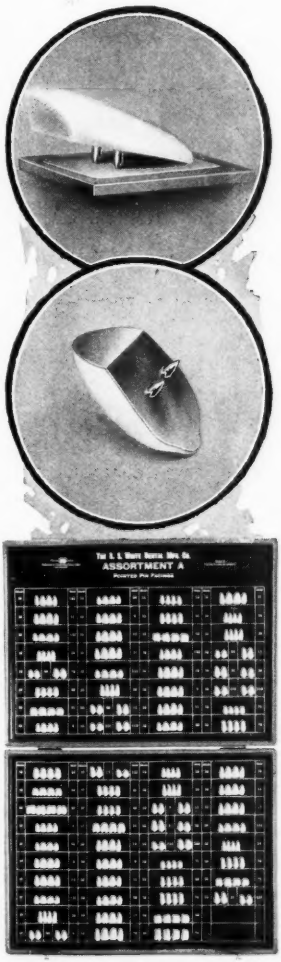
BUFFALO DENTAL MANUFACTURING COMPANY

BUFFALO, N. Y.
U. S. A.
Lock Box 979.

TRADE BUFFDENTCO MARK

REGISTERED U. S. PATENT OFFICE

A Feature Which Is of Paramount Importance



One point of special importance in the backing of a facing, is to get the holes in the backing-plate right as to diameter and position.

When you use S. S. White Pointed-Pin Facings, these two points are safeguarded. The pointed pins punch their own holes in the backing-plate; the holes must be right as to position. The shanks of the pins from the base of the point taper to the head are precisely the same diameter and perfectly formed. Consequently the holes they punch fit them—there's small chance for flux or solder to find its way through the backing-plate to check or crack the porcelain.

Ample range of molds in all colors.

S. S. White Pointed-Pin Facings

Singly $0.40
In $100 lots ..... .36

Assortment "A," 280 Facings
$100.80

Subject to our Cash Discounts and to change without notice

The S. S. White Dental Mfg. Co.
"Since 1844 the Standard"
Philadelphia

New York Boston Chicago Atlanta San Francisco
Brooklyn Oakland Minneapolis St. Paul

NOVOCAIN

The Frequent Users' Economy Packages

The New Style hermetically sealed bottles of 100

N. S. Tablets "E" and "T"
$1.20 per bottle
Box of 10 bottles $10.00

For two per cent solution, dissolve one N. S. tablet "E" or one N. S. tablet "T" in one cc. Ringer solution.

The N. S. tablet "E" is preferable for mandibular injections and for anesthesia when pronounced ischemia is desired.

The N. S. tablet "T" is preferred for anesthesia in non-surgical procedures in patients suffering from anemia, arteriosclerosis and cardiac disorders and also in the very young and in the aged.

H·A·METZ LABORATORIES, Inc.
One-Twenty-Two Hudson Street, New York

Manufacturers of NOVOCAIN **"The Dependable Original"**

S. S. White Card Index System No. 2

Keeps Accounts Up to the Minute

This system provides three groups of records:

***Active*—work in progress**
***Pending*—work done but not fully paid for**
***Closed*—accounts settled**

Alphabetical guides of three colors, to correspond with each record group, enable you to quickly locate any account; the card tells the complete story—work done, time consumed, charges made, cash received.

Card Index System No. 2 is perpetual in form, can be started any time. Because you work from the card at every "sitting" progress is recorded then and there—accounts are kept up to the minute.

You can learn the details in five minutes from our free booklet. Write for it.

S. S. White Card Index System No. 2

Japanned Metal Case, Lock and 2 Keys,
200 Record Cards, 3 Sets of Guides,
50 Examination Blanks,
25 Cash or Bill Cards—

PRICE **$12.00**

At Your Dealer's

THE S. S. WHITE DENTAL MFG. CO.

"Since 1844 the Standard"

211 S. Twelfth Street

PHILADELPHIA

A "Revelation" Revelation

At the Portland, Ore. District Dental Society Meeting, on April 16th, several dentifrice manufacturers were asked to answer some questions.

The manufacturer of *Revelation* welcomed the opportunity.

"Of what advantage or disadvantage is an abrasive content?" asked the Society. We answered:

"An abrasive content is distinctly of no advantage and should never be used in dentifrices. Gritty dentifrices, beyond a doubt, are the cause of mechanical abrasion, recession of the gums and an exposure of the cementum and periodontal membrane, and when the saliva is acid, this action is very rapid. An abrasive will produce a dull satin-like finish on all gold work. Ask any jeweler and he will tell you that a satin-like finish is accomplished either by a sand-blast or a steel brush wheel on a lathe.

"Placques gather more readily upon the cementum—as the cementum has an unpolished surface—and are the nuclei of tartar deposits. Whenever the cementum is exposed, so also is the periodontal membrane, and hypersensitivity of the dentin results.

"I import direct from Liverpool the lightest and fluffiest chalk obtainable because its abrasive power is virtually nil. It is the most lasting of all mild alkalies and the slowest acting ant-acid known. It mixes readily with antiseptics and I can conscientiously say it is the only abrasive used in *Revelation.*"

Send your professional card or a note on your personal stationery and we will mail you full size can of *Revelation* for clinical test.

August E. Drucker Co., 2679 California St., San Francisco, Calif.

REVELATION

FOR TEETH AND GUMS

Dioxogen

In Pyorrhea and those diseases affecting the gum tissues, mouth disinfection is an essential of successful treatment.

The gums become so sensitive that harsh methods cannot be used, and yet the gums must be kept free from irritating food residues.

In such cases Dioxogen performs a real service, it keeps the gums clear, destroys pus and exudates, controls bleeding and has no irritating action.

Upon request a free sample will be sent to dentists who are not familiar with Dioxogen.

Every dentist should try Dioxogen.

THE OAKLAND CHEMICAL CO.

59 Fourth Avenue New York

Leaders-
of the profession use
Waite's
ANTISEPTIC
LOCAL ANAESTHETIC
In Ampules!

MEMBERS of the profession who want an anaesthetic that is more powerful and healing than ordinary procaine solutions in ampules use Waite's Antiseptic Local Anaesthetic in Ampules.

The principal ingredient of Waite's Antiseptic Local Anaesthetic In Ampules is Ortho-and-Para-Mono-Iodo-Phenol, an antiseptic and anaesthetic, which is combined with procaine or cocaine to produce the most positive and lasting local anaesthetic known to the profession. Its antiseptic properties make it a rapid healer of tissue and prevents after pains and soreness.

"Waite's" has long been famed for producing perfect, positive, lasting, non-toxic anaesthesia. Used in millions of cases for over thirty years, it has proven safe every time.

Waite's Anaesthetic is also sold in bottles.

Sample Box of Ampules FREE
on receipt of your professional card or letterhead. Mail the coupon.

Nerve Blocking book FREE
will quickly make you a master of this new and profitable science without private lessons or a post graduate course. See offer on coupon.

THE ANTIDOLOR MFG. CO.
100 Main Street
Springville, Erie County, N. Y., U. S. A.
Branches:
Fort Erie Ont. · Paris, France

100 Check, Sign and Mail this Coupon

☐ Send me sample box of ampules, free.
☐ Ship the following order through

(Name of dental depot)
and mail me Waite's Nerve Blocking Book FREE with any of the following offers:

☐ 12 ounces or ☐ 12 boxes 1½cc Ampules of Waite's Local Anaesthetic, $8.40.
☐ 12 boxes 2½cc or ☐ 12 boxes 3cc Ampules, $10.20.
☐ Waite's Complete Nerve Blocking Outfit for making all injections. Value $13.60, all for $12.00.

Name .....
Address .....

Say: "I Saw it in THE JOURNAL"

The Prophylaxis of Dental Caries

The Cause of Dental Decay: The presence in the mouth of lactic and butyric acids formed by bacterial action on food particles.

The Results of Dental Decay: Roughening softening and penetration of the enamel; damage to the dentine; the formation of cavities affording lodgment for pathogenic organisms, with subsequent development of root abscesses, gingivitis, pyorrhea, etc.

How to Prevent Dental Decay: The daily, systematic application of a suitable, non-irritating, non-abrasive alkaline fluid is the best and most practical method of controlling or preventing dental decay. This is not an empty assertion, but it has the support of authority.

Note. Thousands of your fellow-practitioners have made the discovery that "Phillips' Milk of Magnesia" is just such a fluid. It completely fills the bill. It is the ideal alkalinizer for use in the human mouth.

WHY YOU SHOULD SPECIFY "PHILLIPS' MILK OF MAGNESIA"

a. It is pure, i. e., free from every trace of deleterious substances.

b. It is a hydrate and, therefore, has a special affinity for acids.

c. It acts immediately and efficiently, and has no disagreeable effects.

d. It is three times as efficient as bicarbonate of sodium and *fifty times* as powerful as lime water in neutralizing acids.

HOW TO USE "PHILLIPS' MILK OF MAGNESIA"

Kindly instruct your patients to rinse the mouth with a tablespoonful of "Phillips' Milk of Magnesia," at least twice a day, and invariably at bedtime, as acidity is most likely to develop during sleep.

The nightly application should be made in the following way: Cleanse the teeth well with a toothbrush and warm water. Rinse the mouth thoroughly, then take a tablespoonful of "Phillips' Milk of Magnesia" and work it back and forth through the spaces between the teeth for a few moments—the object being to reach every surface of all the teeth. After rejecting the superfluous portion *do not rinse the mouth again, but allow the alkaline film of Magnesia to remain on the dental surfaces.*

An excellent plan is to use "Phillips' Milk of Magnesia" as a dentifrice, on the toothbrush, instead of preparations containing precipitated chalk.

PHILLIPS' Milk of Magnesia

CAUTION. The dentist is advised to beware of imitations of "Phillips' Milk of Magnesia." The genuine product bears our registered trade-mark. Kindly prescribe in original 4-ounce and 12-ounce bottles obtainable from druggists everywhere.

Prepared only by **The Charles H. Phillips Chemical Co., New York and London**

Get Results by Advertising in THE JOURNAL

Watson Dental Office Cabinet

With Sterilizing Compartment

This clean-lined, attractive-appearing cabinet is both practical and useful and represents the maximum of convenience for the dentist. In designing, our thought was to make a solid, substantial equipment for the convenient housing of operative equipment, instruments, and supplies all within easy reach of the operator. Cabinet is easily cleaned and sanitary and exceptionally satisfactory in use.

The Watson Office Cabinet has all the features required in the modern dental office. There are nine small drawers, four medium drawers, four large drawers and two extra large drawers, as well as a roomy compartment to hold, for ready use, operative instruments, burs, strips, disks, clean lines, supplies, etc. The working surface measures 15x35 inches. It has opalite top. Base is of solid construction and cabinet is 57 inches high over all.

The cabinet mirror is made from heavy polished and beveled plate. Doors in sterilizing compartment are made from chipped glass, while all the doors and drawers are provided with clear glass knobs. Cabinet is made both from straight sawed oak, finished dull golden, and from clear solid birch, finished in rich, dull mahogany.

WRITE FOR OUR DENTAL FURNITURE CATALOG

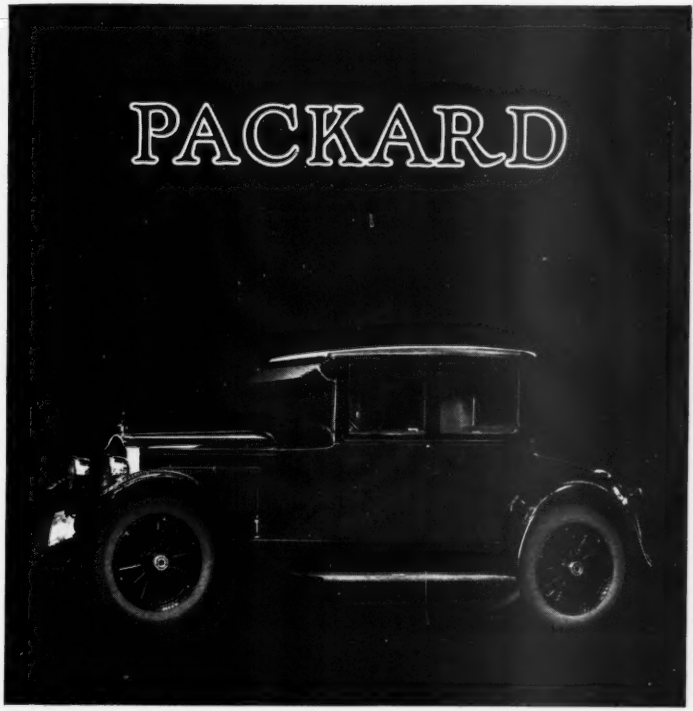
Frank S. Betz Co.

HAMMOND, IND.

New York
6-8 West 48th St.

Chicago
30 East Randolph St.

PACKARD



Professional men are especially keen for the Packard Single-Six.

In it they find that utterly dependable and unwavering service which they are so accustomed to giving—and demanding.

The Packard freedom from mechanical complications gives them the assurance that their Single-Six is not subject to troubles and delays.

They feel free to demand of it performance under which they know an ordinary car cannot possibly stand up.

Any man who uses his car in his work must have the utmost in performance, dependability, driving ease, freedom from the need for frequent adjustments—exactly the qualities which constitute the greatness of the Packard Single-Six.

And Packard superiorities of engineering show themselves in such practical details as these:

16 to 20 miles to the gallon of gas; 20,000 miles to the set of tires; 500 to 1000 miles to the gallon of oil; and a mileage life that can only be figured in tens of thousands of miles as against the customary thousands.

A demonstration will repay you for the time put into it—and point the way to the soundest motor car investment in the world.

Packard Single-Six furnished in eleven popular body types, open and enclosed

ASK THE MAN WHO OWNS ONE

As Nature intended it to be

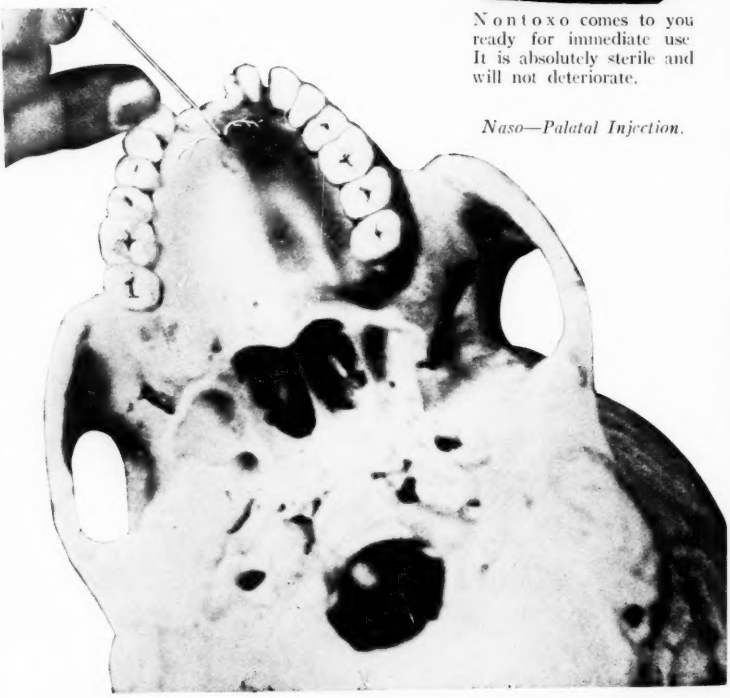
Nontoxo TRADE MARK

THE IDEAL LOCAL ANESTHETIC

Nature intended that a local anesthetic, if one should ever be found, must be nontoxic, perfectly balanced, and should give not the slightest shock from the injection nor cause any pain following it. NONTOXO, in addition to bearing out Nature's commands, is proud of the fact that it is the first American made anesthetic containing Procain (Novocain) and Suprarenin Synthetic Hydrochlorid. It has been used successfully in local anesthesia for over 15 years.

The **RANSOM & RANDOLPH** *Co.*
TOLEDO, OHIO.
(*sole agents*)

Nontoxo comes to you ready for immediate use It is absolutely sterile and will not deteriorate.



Naso—Palatal Injection.

Our new Catalogue is ready—it contains fifty-three useful articles, not to be found elsewhere. This especially interests the man who is fitting up a new office. Send us your name, address and dealer and we will gladly mail you one.

THE DARK DAYS ARE HERE

The Bosworth Operating Light is indicated in every dentist's and physician's office—no matter what light you now have, it brings daylight into the office.

Send for descriptive circular.

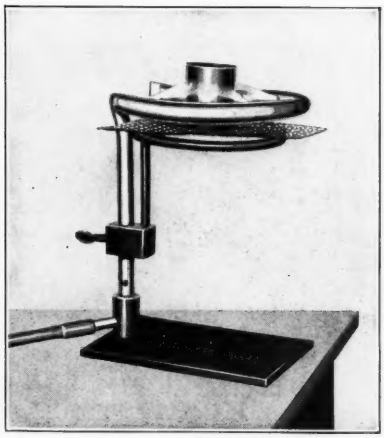
If you are in doubt we will send a light on approval through your dealer. Price $25.00, Black Enamel; other finishes, add $2.50. 300 Watt Blue Nitrogen Lamp, $2.35.

It costs you seventy-five dollars to get it,

It costs you thousands if you don't get it.

Bosworth Efficiency Bookkeeping System makes certainty of guesswork. A simple single entry record keeping set of books that will show up all the lost motion, improve earnings and eliminate complaints over fees.

Send for descriptive circular and information on Mr. Bosworth's classwork.



Solvite
Radial Wax
Eliminator and Heater

(Suggested by Dr. Polk E. Akers)

When an investment is subjected to an unevenly distributed heat the particles will disintegrate unevenly, resulting in poor castings. Whereas if subjected to a heat which will permeate evenly all portions at the same time a truer matrix results which makes possible a sharper and more perfect casting. With a multiplicity of small but powerful jets of blue flame, directed upon all sides of the investment, at the same time permits of an ideal heat condition which can easily be regulated. Made for all kinds of cases. Send for circular on solvite suggestions for better impressions and castings. Made for use with Artificial, Natural or Prestolite Gas. Price $6.00.

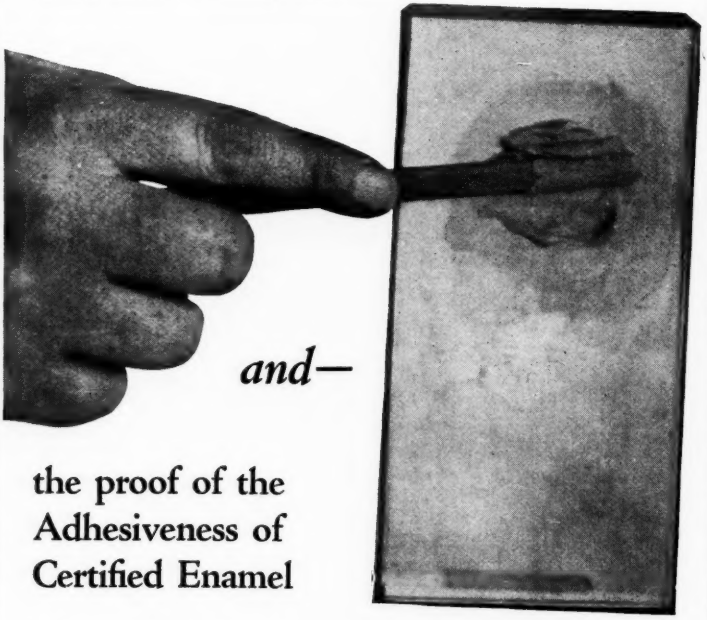
Made for use with Artificial, Natural or Presolite Gas

HARRY J. BOSWORTH COMPANY, Chicago, Ill.
341 E. OHIO STREET.

CAN YOU IMAGINE any dentist using a non-adhesive cement for crown and bridge work?

You can't?

Well, dentists who use Certified Enamel find it just as difficult to imagine how any dentist can use a non-adhesive silicate and get results which are entirely satisfactory.



and—

the proof of the Adhesiveness of Certified Enamel

is demonstrated in the above reproduction of an actual photograph taken in our laboratories, showing that Certified Enamel is so adhesive that the heavy glass slab on which it is mixed may readily be lifted merely by contact of the spatula with the mass while in plastic state.

Ask Your Dealer

The Porcelain Jacket Crown

has long since passed the experimental stage. The practicability of Jacket Crowns is acknowledged by all the leading members of the Dental Profession and the interest in the artistic beauty of dental restorations with porcelain is ever increasing. The years of experience of the Lochhead Laboratories and all of its branches qualifies us to produce superior results that are both a credit to the Laboratories and the Dentist and also pleasing and satisfactory to the patient. The permanency of the Porcelain Jacket Crown when properly constructed over a correctly prepared tooth compares favorably with all dental restorations.

The Correct Preparation Is Not Difficult

as soon as the improved method as advised by these Laboratories is thoroughly understood and carefully followed.

The characteristic peculiarities of the blending and melting of porcelain should also be taken into consideration in the preparation of a tooth and selection of shade.

The flat and continuous shoulder is usually a prerequisite for strength. The tooth must be reduced to such an extent that the completed Jacket, when placed in position, will exactly replace the enamel which has been removed. The crown must have fair thickness both labially without protruding and lingually to free the bite without grinding the crown. In the completed preparation the stump should not be less than two thirds or more than three quarters the height of the completed crown. There should be a slightly converging form extending from the inside shoulder line to the tip or end of the core. The tip should not be reduced to a point but the entire preparation should leave the stump in somewhat the form of a denuded tooth. Roughness, cavities, and all undercuts should be removed, leaving the core perfectly smooth. The following is our list of requirements which should be followed explicitly:

Two tube impressions, taken in modelling compound. The tubes should fit closely over the periphery of the root and under the free gum margin.

The Labial or Buccal surface of the tubes should be clearly marked "X".

Impression taken in a tray using pink base plate wax, showing several teeth on either side of the tooth to be crowned.

Bite taken in pink base plate wax, pressing well over the surfaces of both uppers and lowers.

Shade a Sample Taken from Any Standard Shade Guide

The Lochhead Laboratories, Inc.

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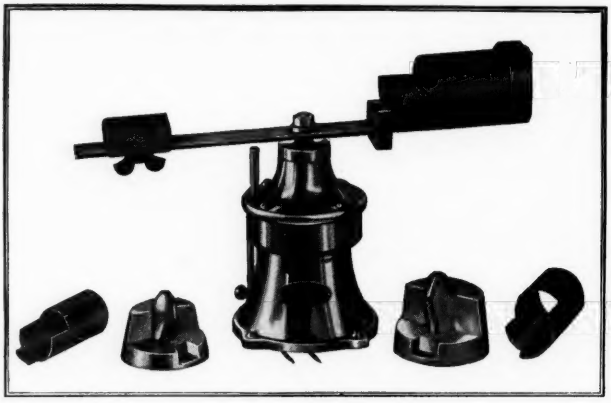

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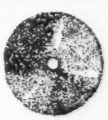

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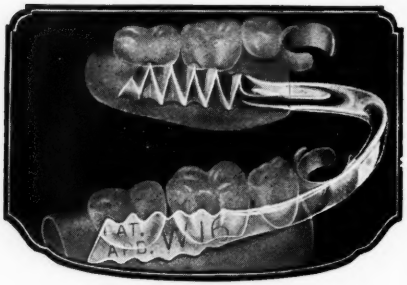

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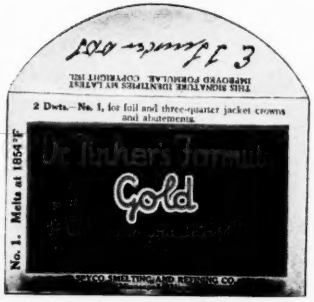
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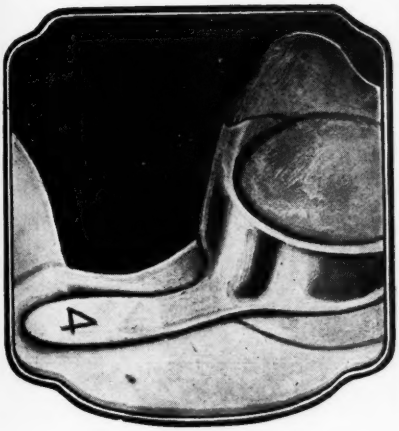

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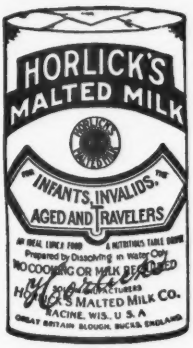
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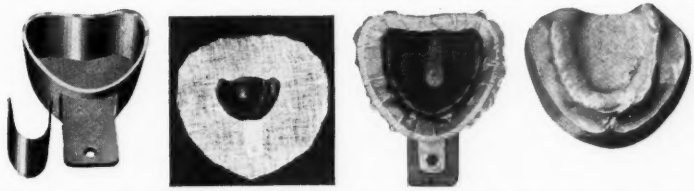

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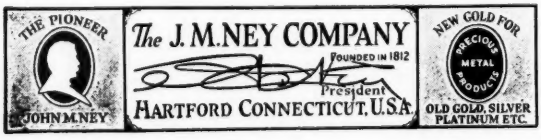

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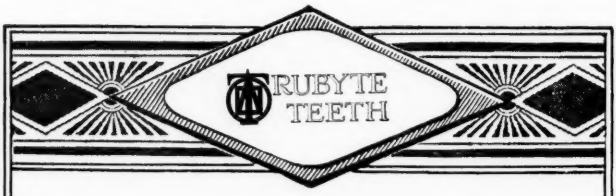

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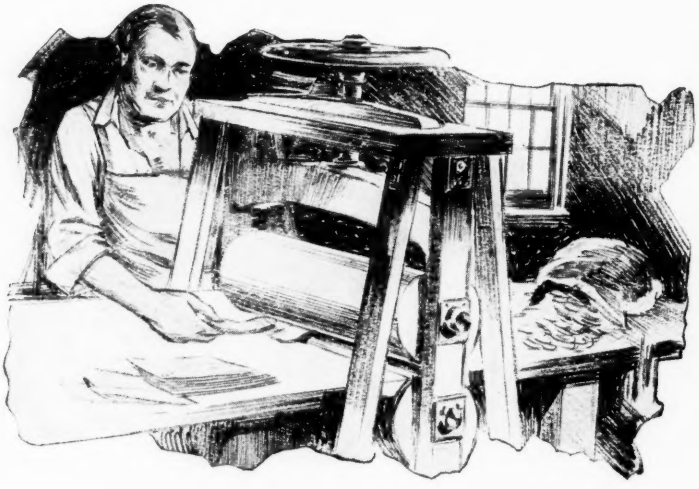

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